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MECHANIX ILLUSTRATED

SEPTEMBER

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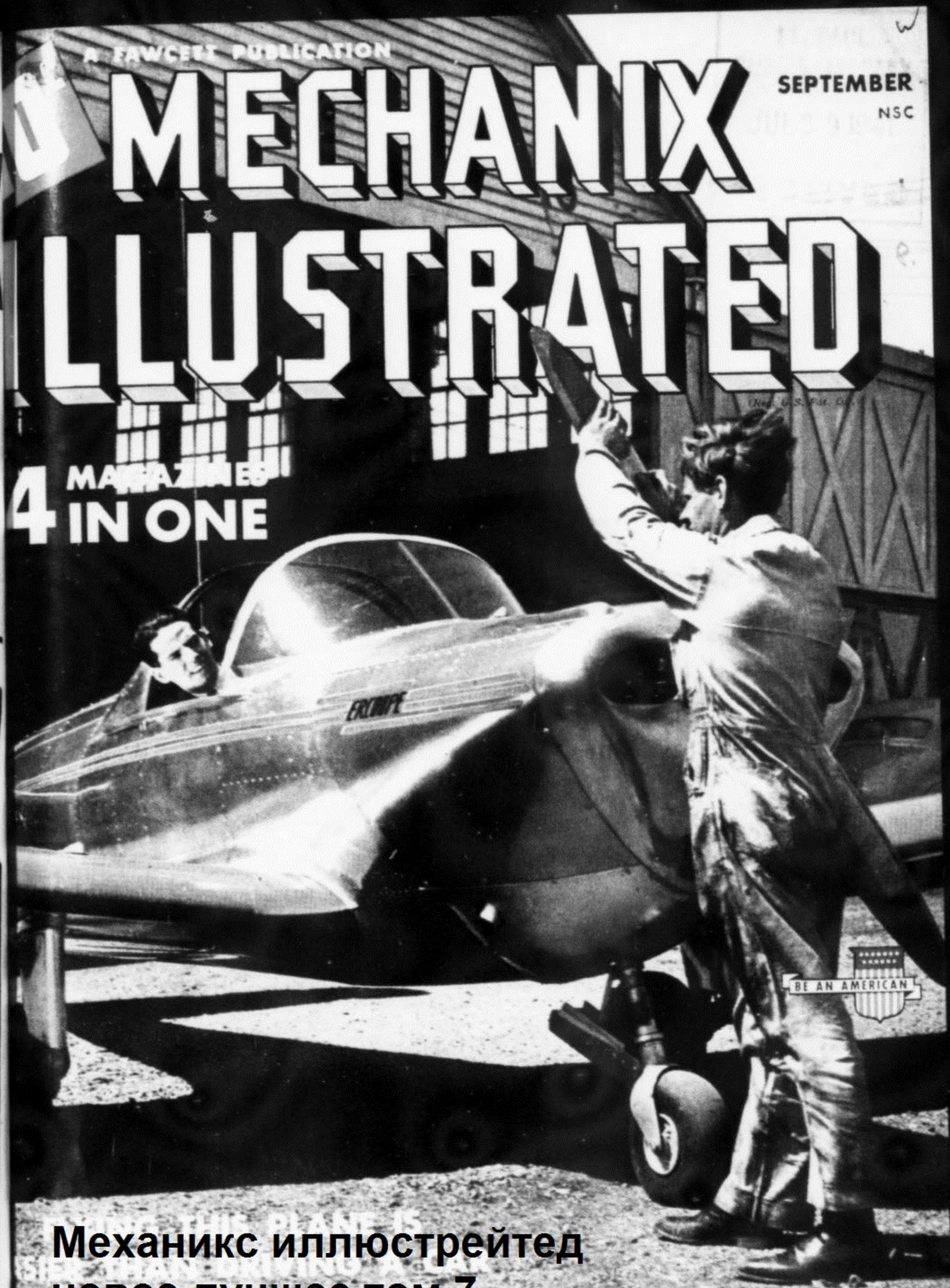

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SEPTEMBER
1941

Volume XXVI
Number 5

W. H. FAWCETT, JR., President

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MAXWELL HAMILTON

Maxwe
Hamilton, wh
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"I Flew My F
Time Up!"
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MECHAN
ILLUSTRAT
readers throug
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this magazi
pages from t
to time.

Mr. Hamilto
a graduate of Y
University, h
had many ye
of experience in the newspaper and ma
zine business, having been a columnist
The Brooklyn *Eagle*, reporter and feat
writer for The New York *American* and
New York *Evening Journal*, where he w
also assistant drama editor.

Mr. Hamilton says he cannot understa
never having been in an airplane bef
his first unique trip aloft.

They fly nearly eight miles abo
the earth, in the cold, blue voids
the sky where the mercury is
below zero. Their snarling plan
seek out the high-flying invadi
bombers who skim invisibly ov
great cities to drop their burdens
death, unseen. They are the newe
the most romantic, the most dar
devil—and the least known—arm
the Aviation Command: The Strat
sphere Patrol!

The greatest problem to be beat
by the patrol is the "blackout," th
bloody unconsciousness into whi
a pilot is thrown as he pulls out of
howling power dive. Scientists
the famed Mayo Clinic have be
working on the puzzle secret
Don't fail to read Bill Kimball'
thrilling and scientifically amazi
story on it in the October M
Stratosphere Patrol!

ROBERT HERTZBERG, Editor

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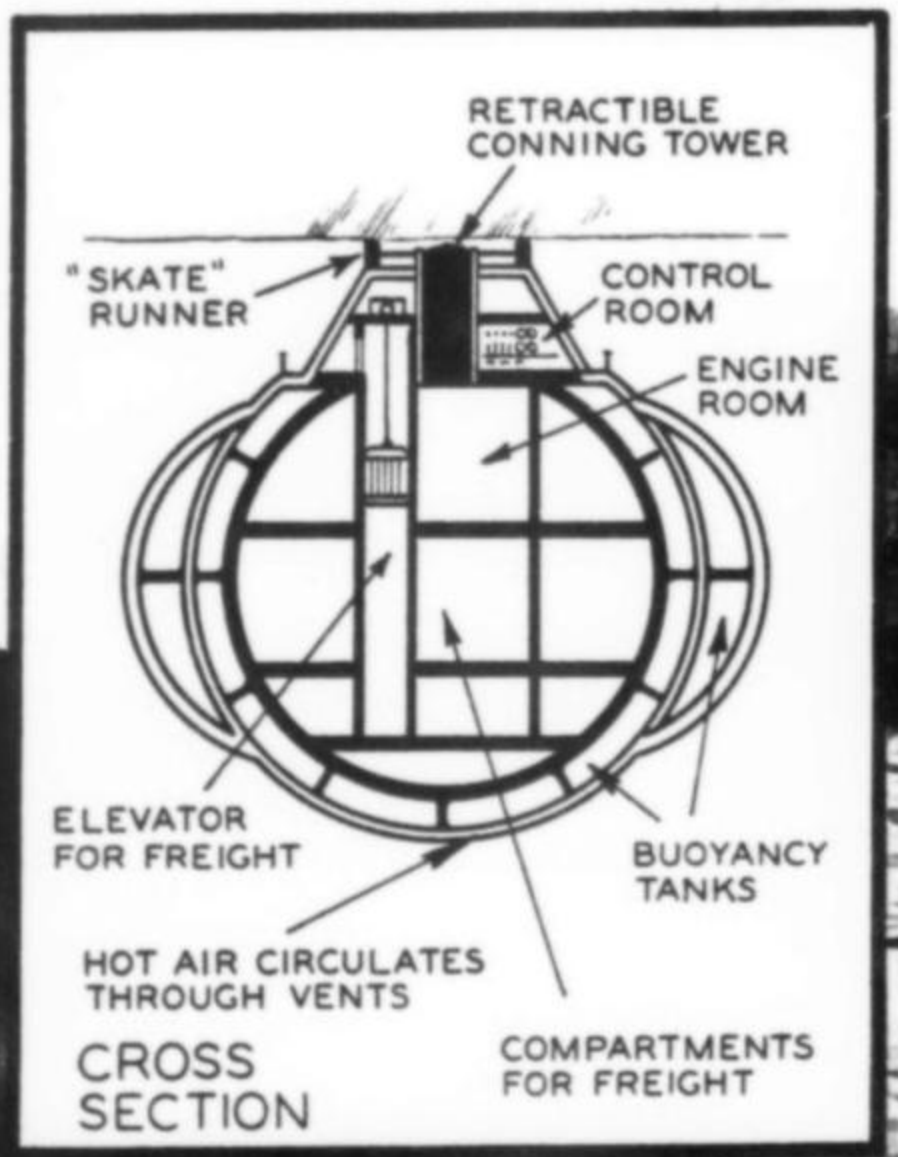
LIFELINE UNDER P

The British are planning great cargo submarines to navigate under the North Pole and polar ice-cap, escaping enemy raiders in a new lifeline!



ER POLAR SEAS!

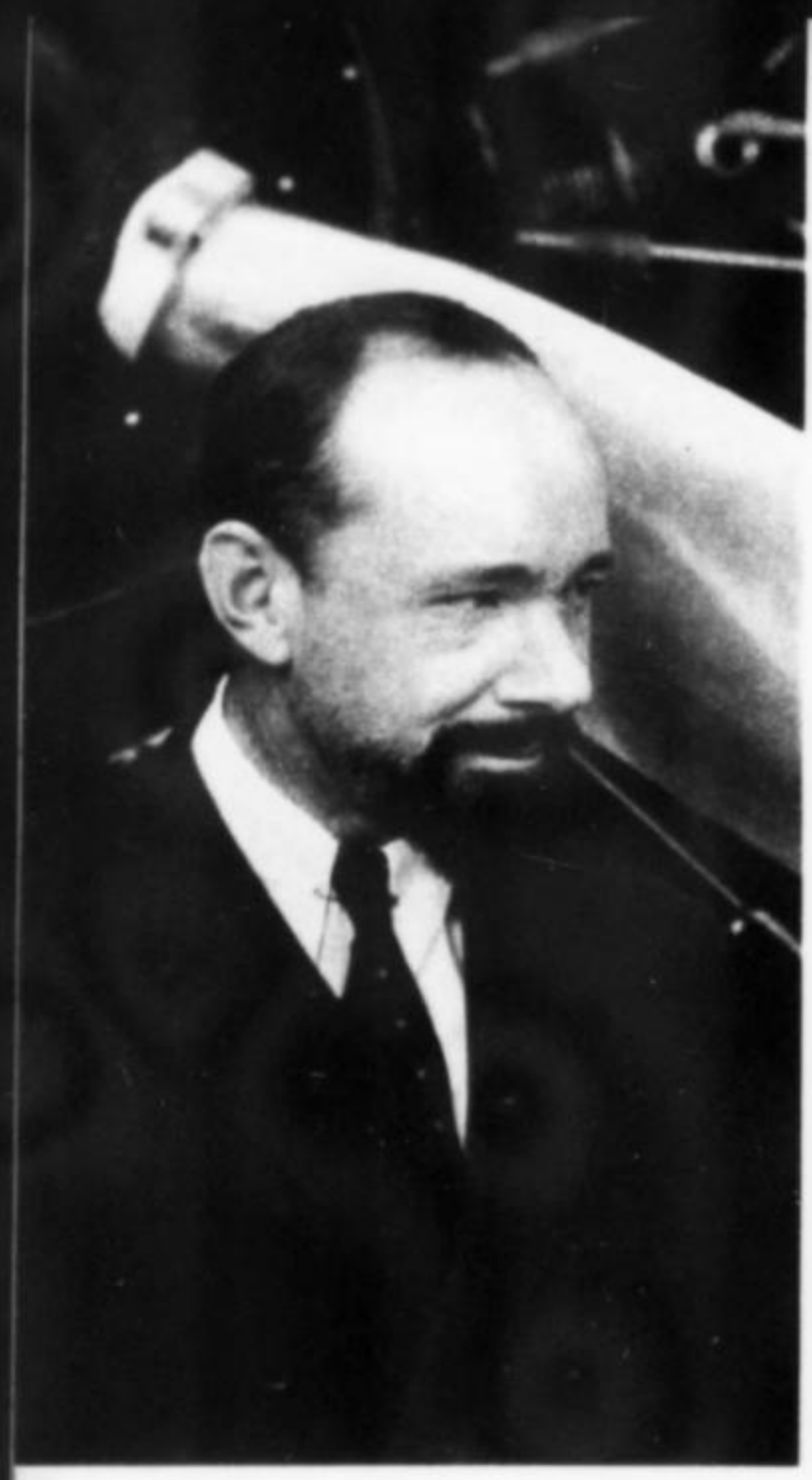
by
Carl Cronin

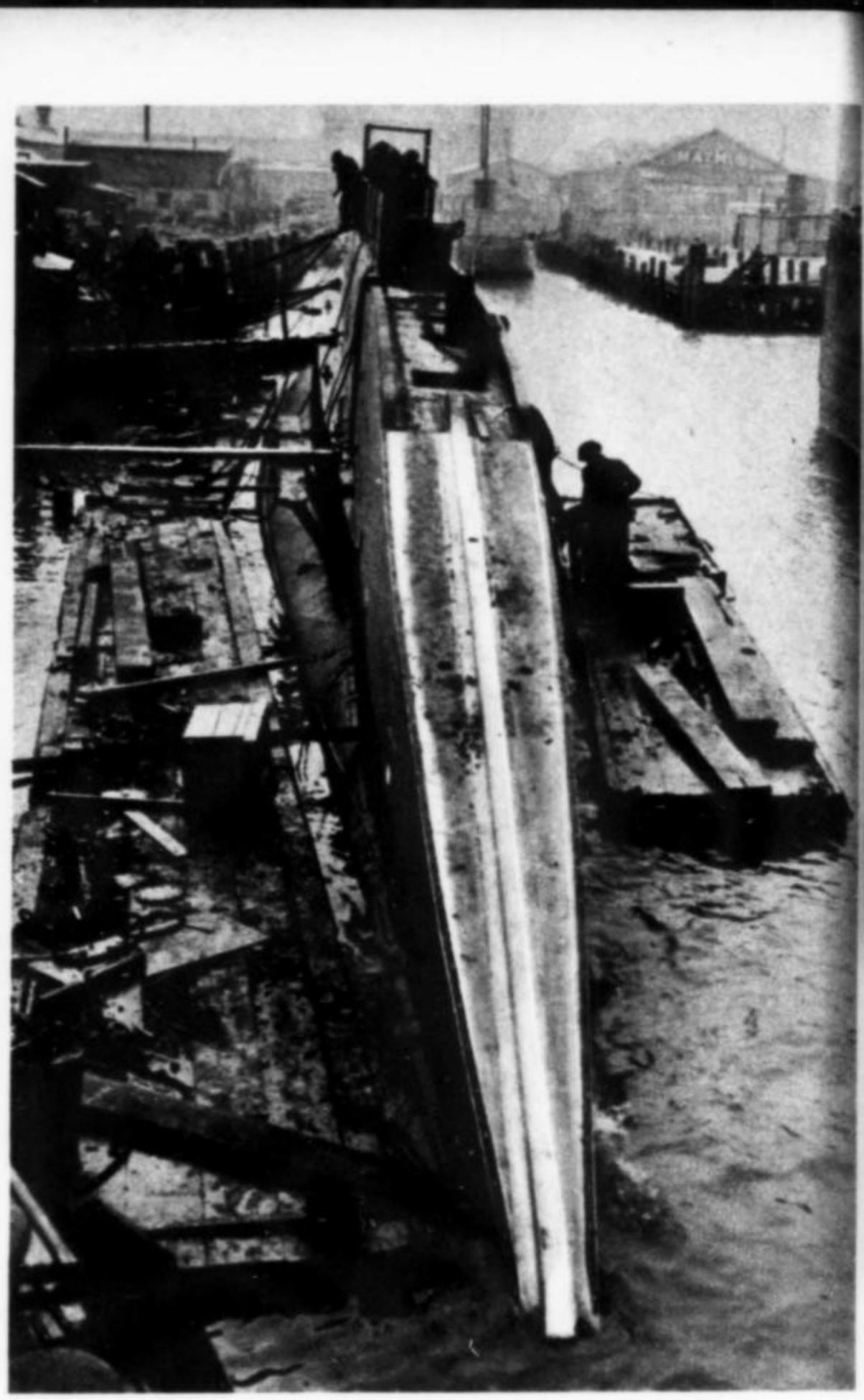
GREAT BRITAIN, faced with a steadily rising rate of shipping losses in the Atlantic, has plans for a sensational new type of cargo-carrying submarine designed to *cruise under the North Pole!*

Fantastic at first blush, the plan has two obvious advantages: 1. A trade route under the polar ice cap would dodge the worst present concentrations of enemy raiders in the Atlantic; 2. A route by way of the North Pole would actually shorten Britain's lifeline to Australia, New Zealand and India by from 1,000 to 3,000 miles.

Reports leaking through the censorship from London do not state clearly whether work has actually begun on such a submarine, but do clearly indicate that specific plans for a fleet of polar submarines are at hand.

Due to troubled conditions in the Mediterranean, Britain was forced to abandon her Suez trade route many months ago. This forced the British lifeline to





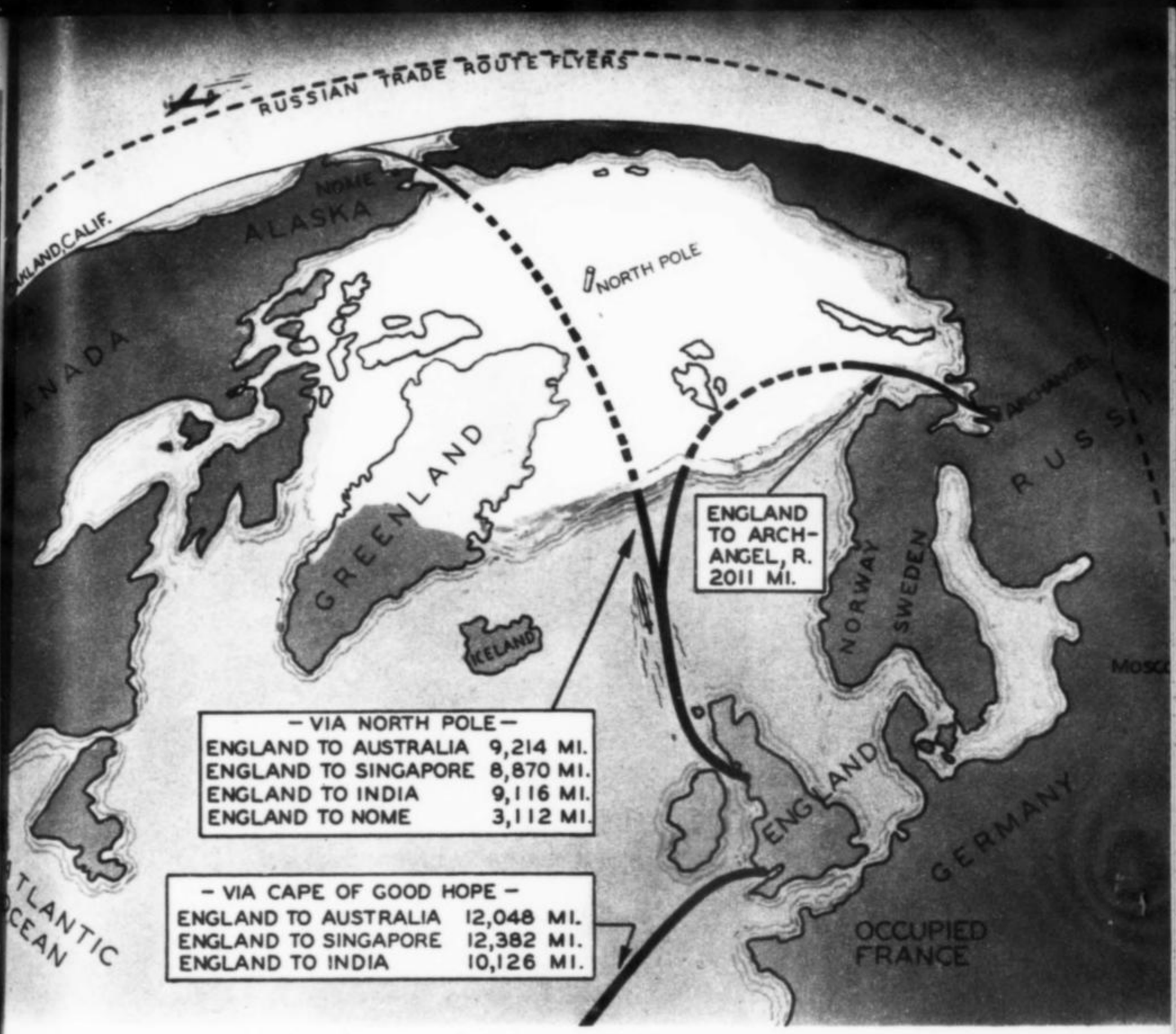
The British have obtained invaluable data for their new super-submersibles from the lessons learned by Sir Hubert Wilkins (above) in his cruise in the ill-fated *Nautilus* (shown at the right). Wilkins tried the North Pole trip but failed.

The Russians long ago recognized the fact that a route by way of the North Pole would cut distances in world trade. In 1937, the three Russian flyers shown in the photograph below flew from Moscow over the North Pole to Oakland, California.

extend down the coast of Africa and around the Cape of Good Hope to Britain's possessions in the south Pacific and Indian seas.

Singapore, for instance, is 12,382 miles from the British Isles by way of Capetown. A route cutting from Glasgow straight across the top of the globe, through the Bering Strait and down the Pacific ocean, is only 8,870 miles to Singapore—a saving of 3,512 miles! Similarly, lesser savings are made to Australia, India and New Zealand.

Nazi submarines and air raiders have been taking an increasingly disastrous toll of British shipping as the war continues. The annual rate of loss, based on sinkings in April and May of this year, is in excess of 6,000,000 tons



This map, drawn by Staff Artist Reynold C. Anderson, shows graphically the great distances which would be saved by a submarine trade route under the polar ice cap. The saving from England to Singapore, "Fortress of the East": 3,512 miles!

British shipbuilding capacity in 1939—before bombing of ports and shipbuilding facilities had seriously begun—was estimated at only 1,382,420 tons a year. With the British losing ships at the rate of 6,000,000 tons a year and replacing them at less than 1,500,000 tons annually, it is obvious they will be forced to resort to some other means of transport soon—even though U. S. aid is given them.

Reports from London give the high-light details of the proposed polar submarines. They will approach the size of the greatest cargo-carrying merchant ships of today. Since submarines must surface at least one a day to run their diesels and recharge their batteries, they will be equipped with retractile ice-cutting hatches and ventilator tubes, capable of cutting through 100 to 125 feet of ice to the air. The submarines will have radio depth sounding equipment, with beams directed downward and also forward. The forward beams will warn against submerged ice walls. Navigation apparatus will rely on radio triangulation upon known shore wireless stations, to eliminate the necessity of shooting the sun or stars, in case of long submerged runs.

Besides being heavily insulated against polar cold, the outer walls of the submarine will be heated by hot-air blasts to insure against the danger of the underwater ships being frozen in while on the surface in open water recharging.

Most explorers agree that there are no great land masses at the North Pole, such as are found at the South Pole, and that, consequently, there will be little difficulty in finding a direct open water passage under the ice cap.

The best guess of experts in America is that the British plan to operate a "shuttle" system between Nome, Alaska, and some North Scottish port with their cargo submarines. Cargoes could be transferred at Nome to reg-

A close-up of the ice-cutter hatch on the British polar submarine is shown in the above sketch by Staff Artist Anderson. This hatch, together with ventilator shafts, are retractile. Spinning cutting edges knife through 100 feet of polar ice.

ular merchant ships to complete the journey to the Pacific and Indian ocean possessions. In this manner, maximum use of the polar submarines would be insured.

Distance of the route from Glasgow to Nome is calculated at 3,112 miles and the route could probably be traveled in approximately 15 days. This is only slightly longer than the route from Southampton to New York.

During the greater part of the year, the polar seas have great stretches of open water at more or less regular intervals, according to the reports of explorers. Even during the most severe weather, these areas are not frozen to a depth of more than 20 feet. It would be a simple matter for such a super-submarine to surface its hatches and ventilating tubes through ice of this nature and recharge.

Vilhjalmur Stefannson, famous Arctic explorer, predicted nearly 15 years ago that the polar route would be used by submarines eventually.

"In 10 to 20 years, I am confident we will see improved submarines making regular trips under the polar ice," he said at that time. "The polar ice is from four to 20 feet thick in most places and the maximum thickness of the ice pack is not more than 120 feet. By actual freezing, the ice is never more than 70 feet thick at any place. The grinding of the floes causes it to pile up in some places.

"However, if a submarine were to navigate at a depth of 150 feet it would be quite safe and it would not strike any snags of ice. Icebergs might be encountered in the regions of Spitzbergen or Greenland, but in those districts the submarine would be traveling on the surface and could avoid bergs in the same way that other ships do.

"There is a current flowing from the Bering Strait toward England, and a disabled sub very likely would be washed under the ice to open water and safety in time."

Since Stefannson spoke those words, great

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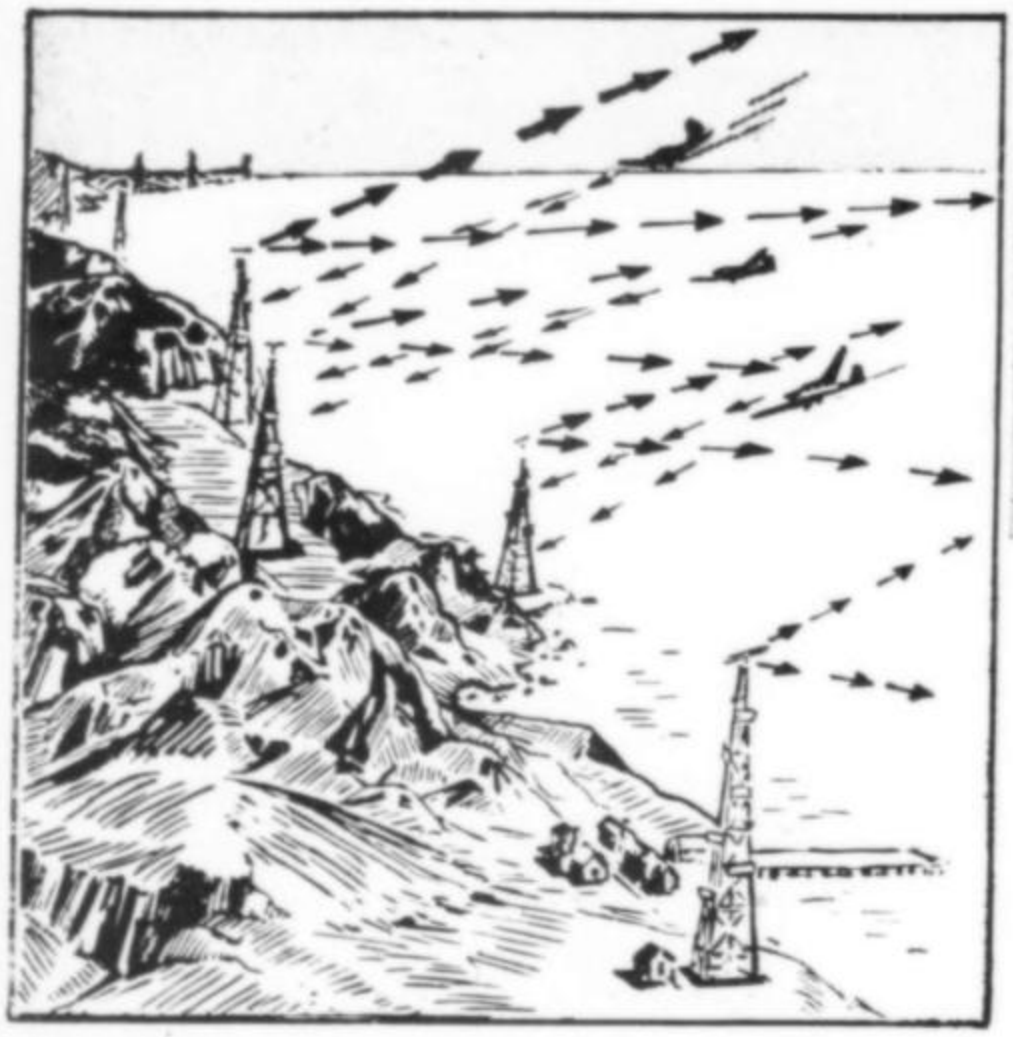
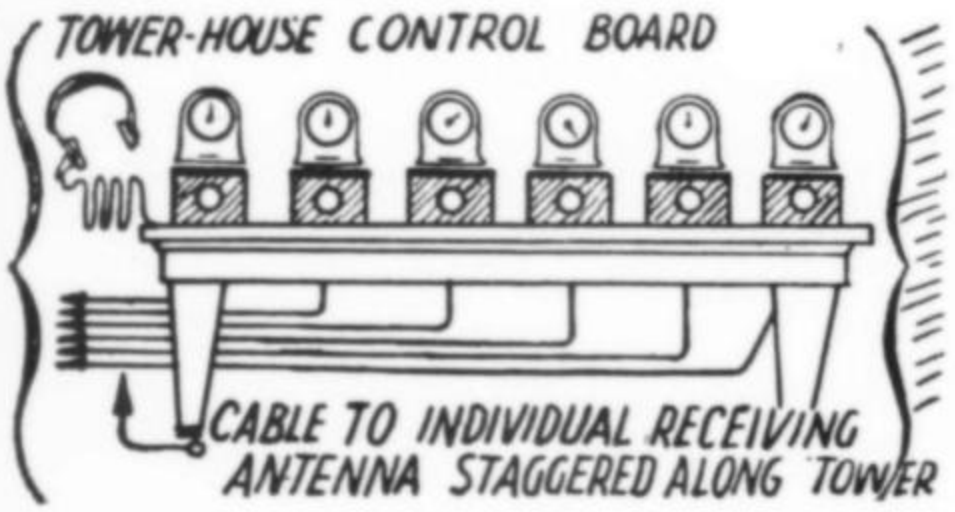
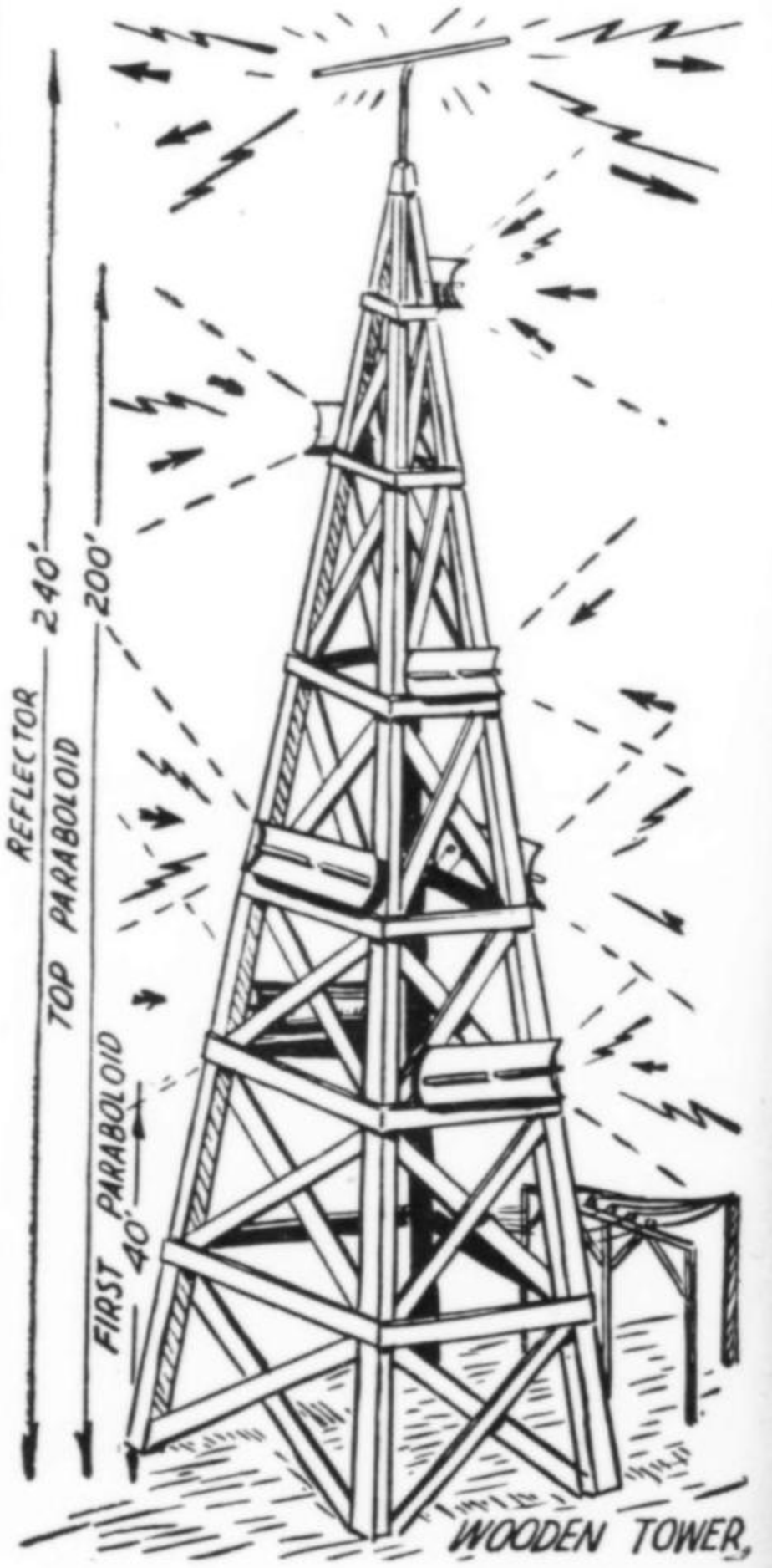
British Radio-locator Secret Revealed



MYSTERY of Great Britain's radio-locator, which spots approaching Nazi bombers, has been penetrated by Dr. Lee de Forest and explained by means of these sketches. Radio-locators consist of detecting mechanism mounted on 240-foot towers around the British coast. Atop each tower is a huge reflector which throws a cone of radio beams into the sky. When a plane comes within the cone, the beams are reflected back and picked up by parabaloid directional receivers on the towers. Dipole antennae register intensity according to distance and altitude and give location of enemy plane instantly. Major Malcolm Wheeler-Nicholson accurately forecast these radio-locators in August MECHANIX ILLUSTRATED.





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SPECIAL FEATURES

On the Cover: Modern Merlin—a welder at work in a plant where many of the welders paint witch-doctor faces on the masks they wear while making bad medicine for the Axis. Kodachrome by Balkin-Pix.

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Explorer and Assistant Curator of the American Museum of Natural History

LT. COMDR. BOB BARTLETT
U. S. Navy

ROBERT COLES
Noted astronomer, Assistant Curator of the Hayden Planetarium

NEXT MONTH!

Maybe you've wondered sometimes why it is that the Squire of 79 Wistful Vista, otherwise known as Fibber McGee, never gets around to straightening out that hall closet Well, the reason is, that he's too busy in his home workshop. You'd hardly believe it, how busy he is in that workshop! He's so busy there that—but let him give the whole story to you himself, including why he thinks sometimes he'd rather be known as Zipper-Lip McGee than as Fibber. Don't miss "My Day—In My Workshop" by Fibber '(Zipper-Lip) McGee, in the April issue of MECHANIX ILLUSTRATED.

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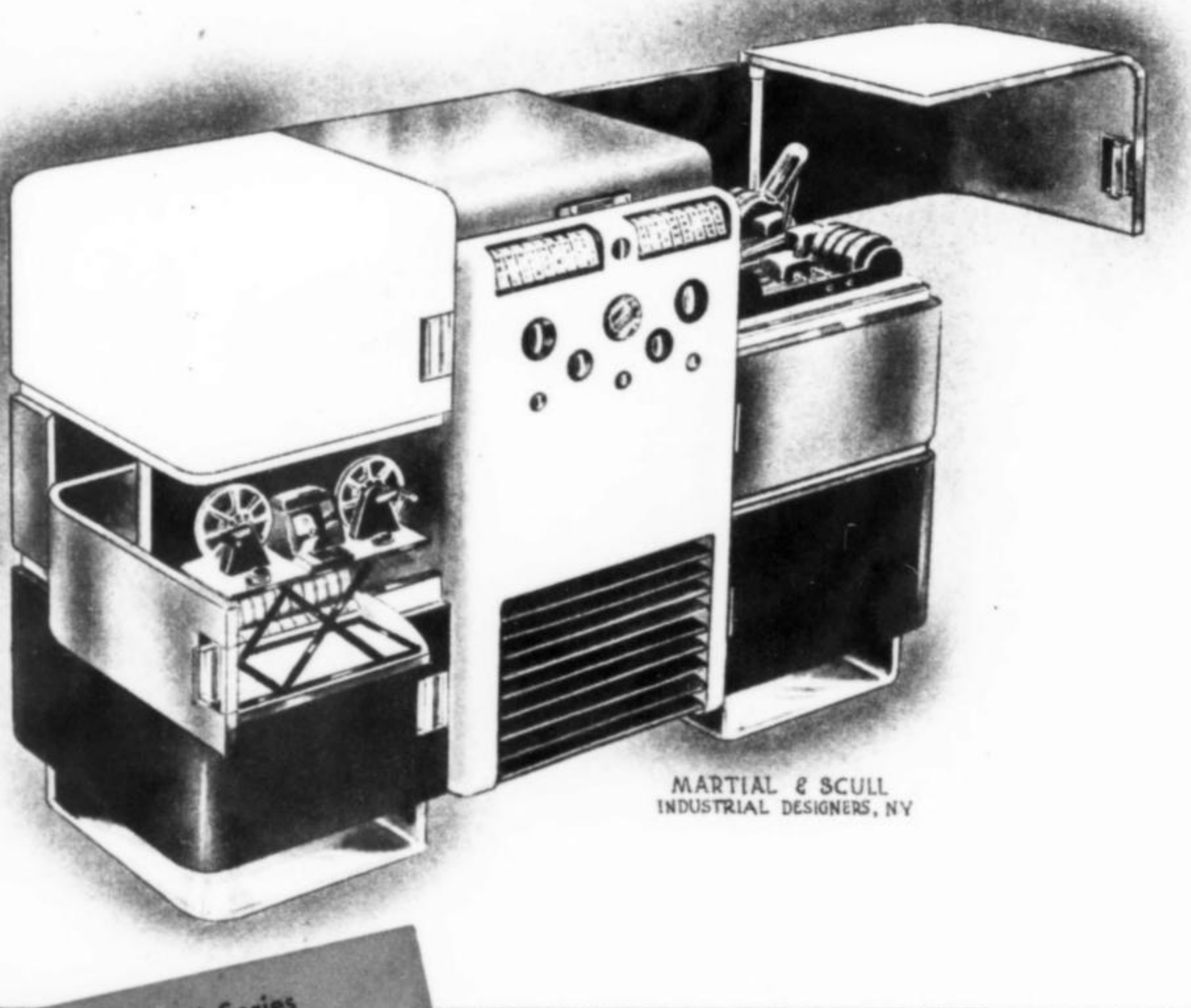
THE POST-WAR RADIO

by Donald G. Cooley

Radio designed by Martial & Scull, industrial designers, New York



The magic home theater that may be yours after the war. In this one cabinet are radio, television, movies, phonograph "records" on film sound track, "focused beam" speaker, automatic program selector, etc.

Sixth in the MI Series

"A WORLD YOU NEVER KNEW"

"WELL, darling," you remark to Her, "what do you say to moonlight and roses tonight?"

This would seem to take a bit of doing. Outdoors, the moon is hidden behind dark clouds and the rose bushes in the garden lie under two feet of snow.

So you decide to bring the moon up from the South Seas and pin it on a wall of the living room. Beside the davenport sits an inconspicuous cabinet about half the size of a small desk. It has a shimmering plastic surface of a color to harmonize with the furnishings. You slide open a disappearing panel, disclosing a dozen knobs and dials, and after a moment's study you twist one of these.

"Oh, isn't it beautiful!" sighs the young lady soulfully.

It *is* beautiful. She is referring to the full-size scene that has suddenly come alive on a wall of the room (opposite the sofa, of course).

Golden moonlight filters through dark palm tree fronds. Yellow moonbeams dance and shimmer on the green and purple ripples of a warm tropic sea. A red canoe glides into the scene and you hear water dripping from the orange paddle held by a young man who croons romantically to a girl propped up by brightly colored cushions.

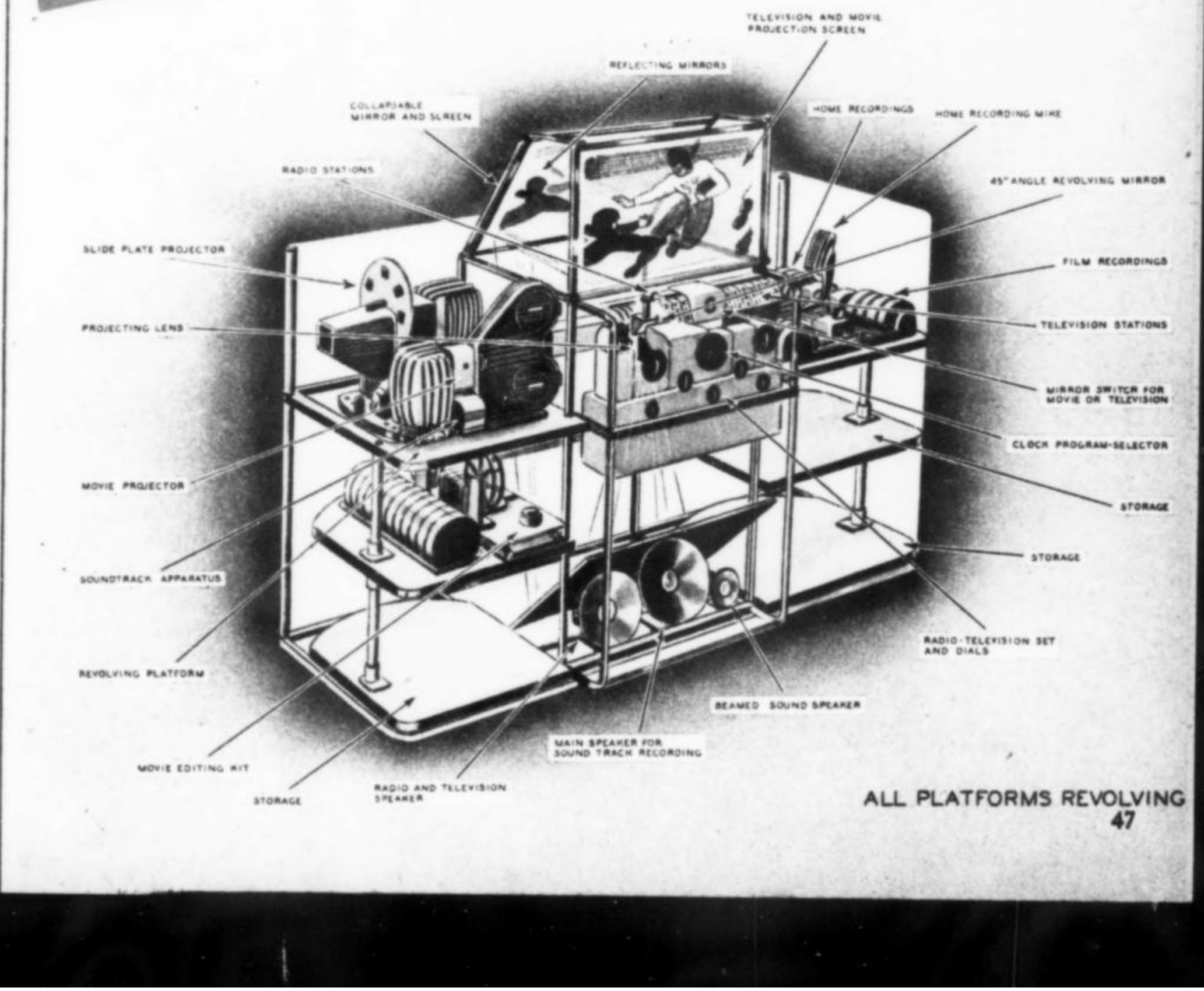
What is it—a movie with sound effects projected from that small plastic cabinet? No, it's actual moonlight, actual palm trees, actual singers, brought right into the room by the marvel of television. What you see on the wall is actually taking place hundreds or thousands of miles away. Perhaps the scene comes from Tahiti, or Florida, or Cuba, or Mexico—you have the whole world at your fingertips.

Suppose the young lady has invited you to a home-cooked dinner. As you sit at the table, an entire wall of the dining room suddenly becomes Niagara Falls. You hear the dull roar of water tumbling over the brink. watch a river boat scuttle in and out of the mists. Maybe you'd rather let some floor-show cuties entertain you to the accompaniment of your favorite orchestra. Or, in a more quiet vein, you can watch the brilliantly colored Grand Canyon stretching illimitably away from you, as if the wall had opened up into all outdoors.

What wonders come out of that small cabinet in the living room! Tiny as it is, it prints a tabloid newspaper, brings photographs and cartoons, remembers to turn itself on when you want it to, writes your letters, reads your books, carries you to the scene of news events while they are happening, broadcasts radio programs that are marvelously clear to you, yet totally inaudible to Grandpa reading his paper a few feet away—stores up news events so you can see and hear them at your leisure. plays symphonic or rug-cutting music for 20 hours at a stretch from a tiny film roll no larger than your hand, and delivers other miracles.

That's the marvelous kind of home entertainment you're going to have in the post-war world, the world we are fighting for. Not overnight, of course, but sooner than you think: for the war itself has speeded many secret researches and the technical means of accomplishing most of the wonders we have described are already perfected. Best of all, that small electronic wonder-cabinet will be

How your post-war radio will operate; reflecting mirrors are used to project three-dimensional movie and television images in color.

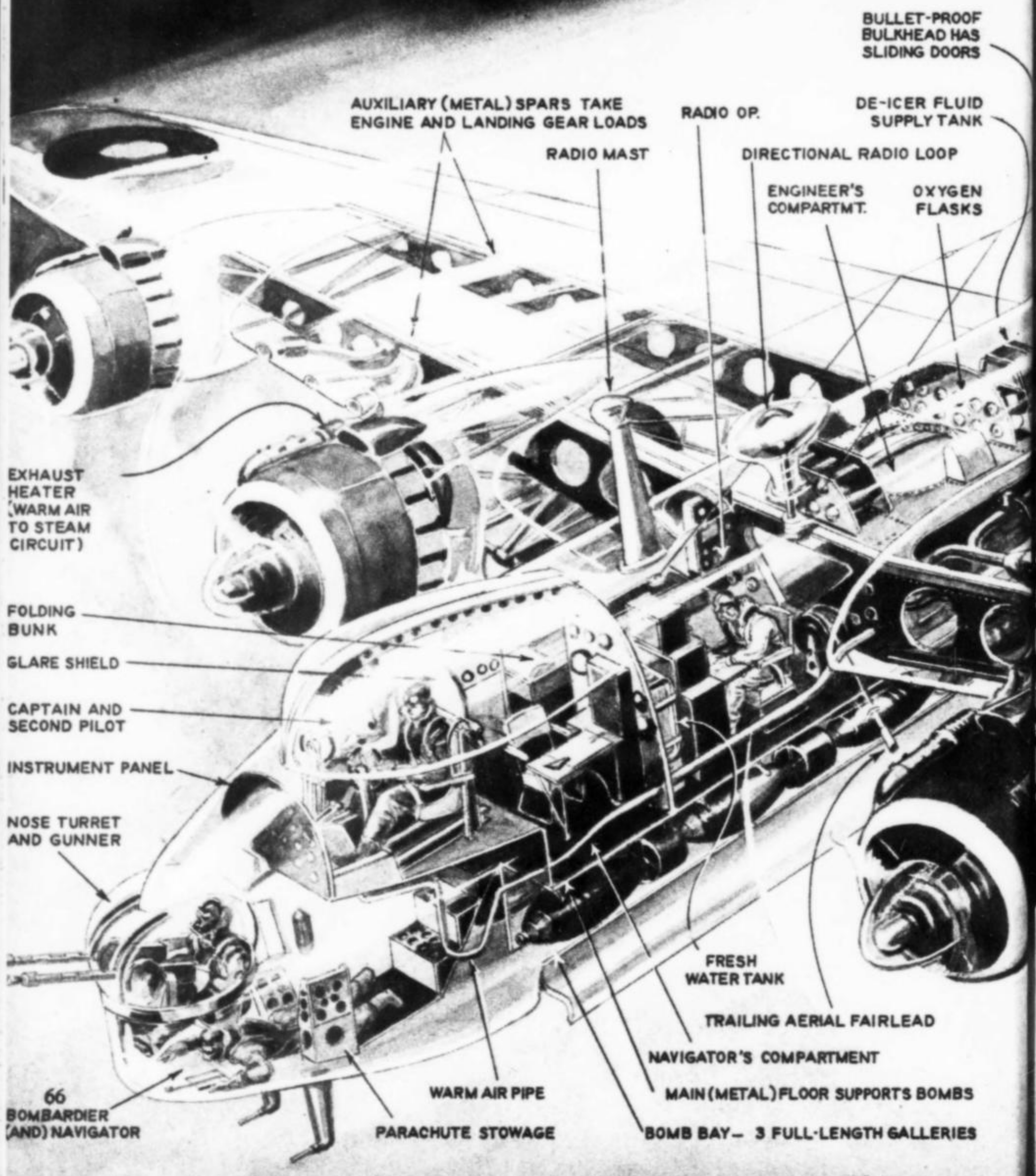


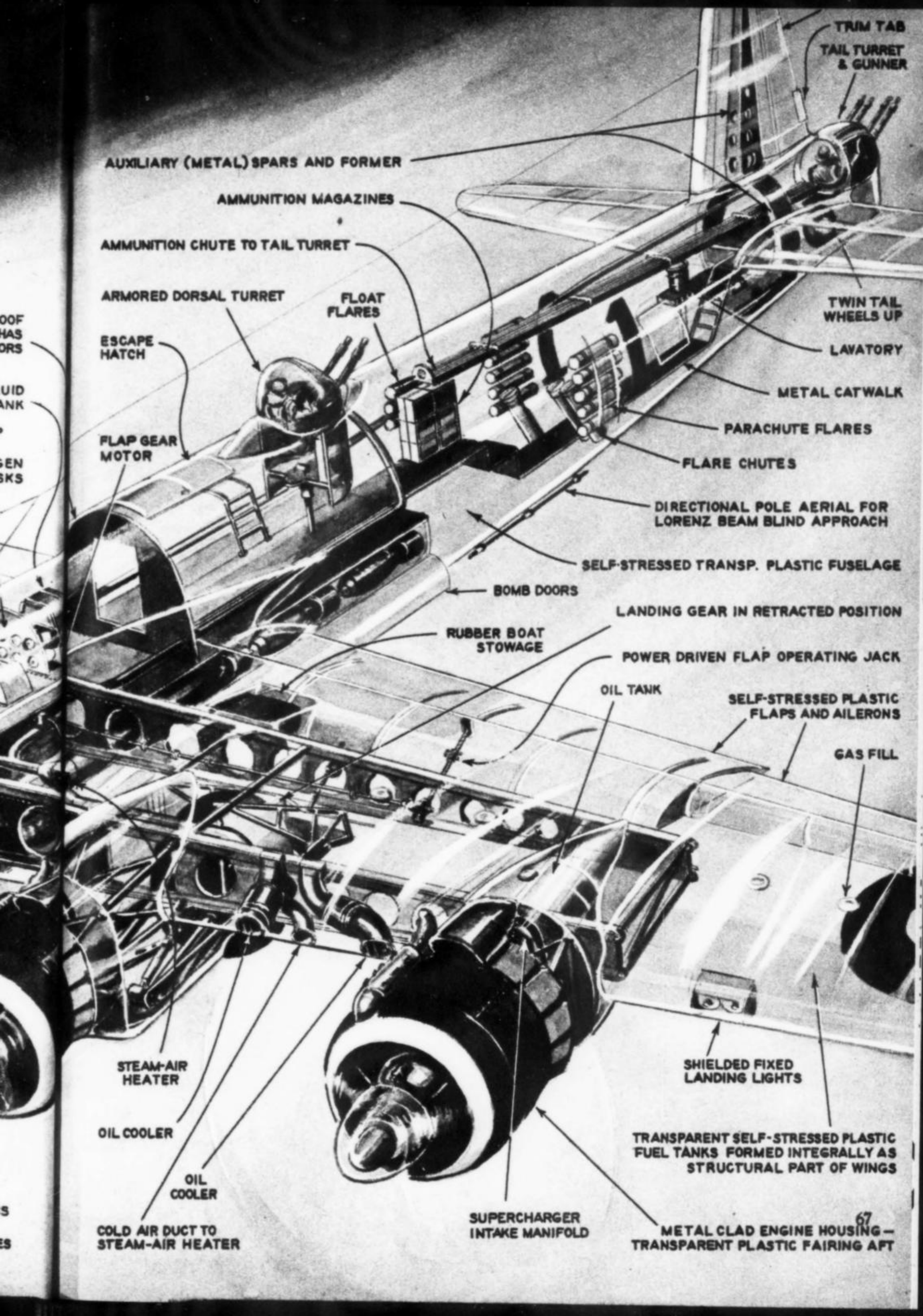
ALL PLATFORMS REVOLVING

Transparent Bomber

by Lieutenant Douglas Rolfe, R.A.F. (Hon.)

HERE'S an idea for an all-plastic bomber, which would be practically invisible at bombing altitudes. It's based on a British Sterling. The design enables you to see exactly how a big bomber operates.

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PARACHUTE FLARES
FLAP GEAR MOTOR
FLARE CHUTES
DIRECTIONAL POLE AERIAL FOR LORENZ BEAM BLIND APPROACH
SELF-STRESSED TRANSP. PLASTIC FUSELAGE
BOMB DOORS
LANDING GEAR IN RETRACTED POSITION
RUBBER BOAT STOWAGE
POWER DRIVEN FLAP OPERATING JACK
OIL TANK
SELF-STRESSED PLASTIC FLAPS AND AILERONS
GAS FILL
STEAM-AIR HEATER
SHIELDED FIXED LANDING LIGHTS
OIL COOLER
TRANSPARENT SELF-STRESSED PLASTIC FUEL TANKS FORMED INTEGRALLY AS STRUCTURAL PART OF WINGS
OIL COOLER
SUPERCHARGER INTAKE MANIFOLD
COLD AIR DUCT TO STEAM-AIR HEATER
METAL CLAD ENGINE HOUSING — TRANSPARENT PLASTIC FAIRING AFT

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HAVE YOU A GENIUS IN YOUR HOME?
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OCTOBER 1943

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VOL. XXX NO. 6

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Editors: Roland Cueva Bill Williams

Associate Editors: George Daniels, *Aviation;* Thomas J. Naughton, *News;* Gilbert Paust, *Crafts & Hobbies;* Mary Driscoll, *Production.*

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SPECIAL FEATURES

On the Cover: Three of the U. S. Army's deadly attack bombers pictured together in a remarkable photo. The Douglas A-20 and A-24 have long been outstanding in news of the war; the A-36 scored its first publicized victories against the Axis in the attacks on Pantelleria and Sicily. Picture taken at Army Air Force School of Applied Tactics by Harold Kulick.

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LT. COMDR. BOB BARTLETT
U. S. Navy

ROBERT COLES
Noted astronomer, Assistant Curator of the Hayden Planetarium

NEXT MONTH

South of the Caribbean, the biggest, richest frontier territory the world has ever known is beginning to open up. Modern transportation, efficient machinery are reaching out into lands of almost fabulous wealth for the first time; there are oil wells and successful mines today in places that were untrodden jungle only a few short years ago, and there are more of them on the way. But the biggest boom of all will come when the war is over, for only then will labor and industry be released and able to push development to the full. Next month, MI begins a new series to bring you news of the rich and beckoning lands of the South. Don't miss the story of Bolivia, first of the Post-War Frontiers, in the November MECHANIX ILLUSTRATED!

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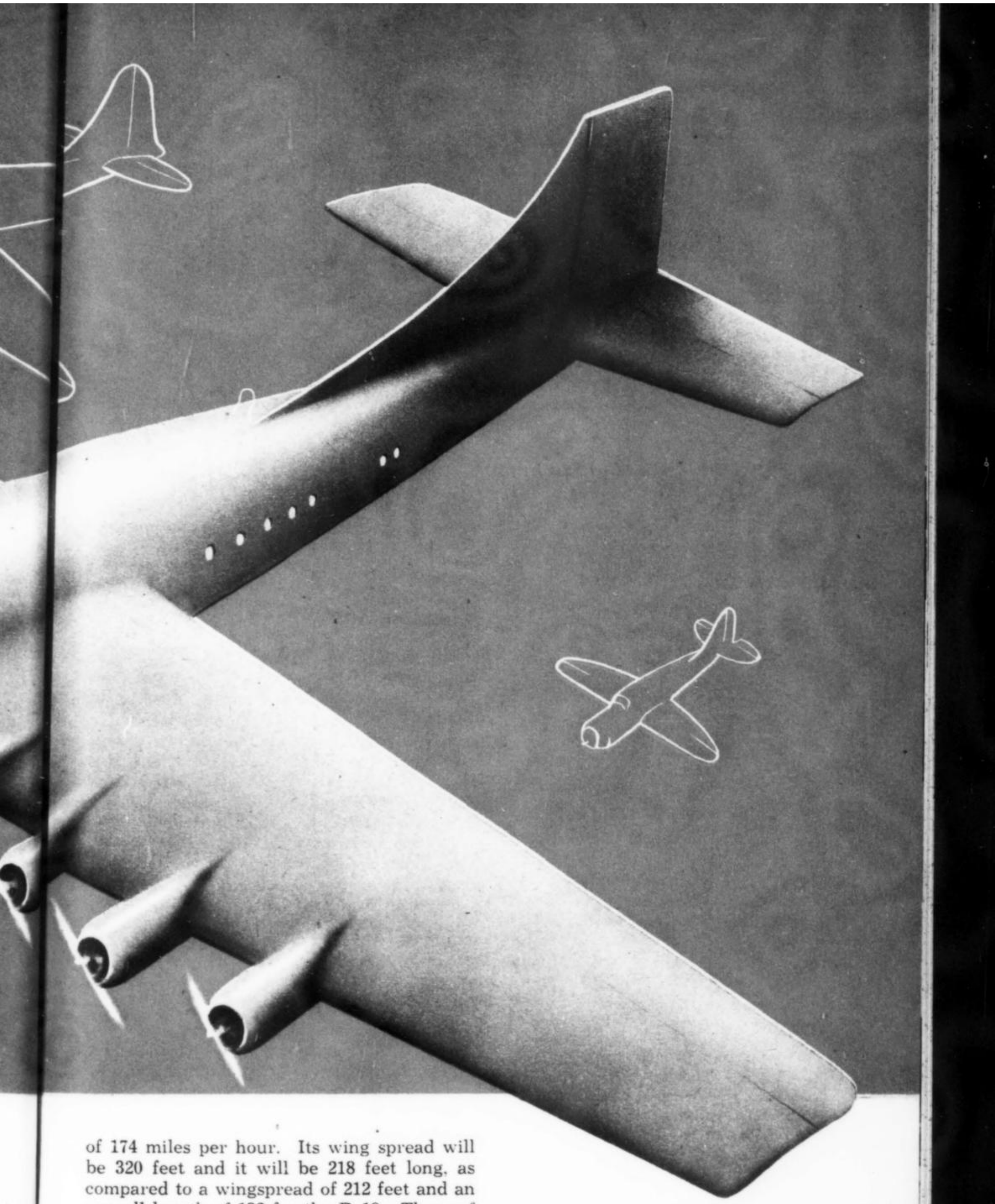
Mechanix Illustrated Art by Fred Ripperda

HENRY KAISER'S CARGO PLANE

HERE is the first published picture of Henry Kaiser's cargo plane, now being built by the Hughes Aircraft Company of Culver City, Calif., scheduled for completion next spring. It will be two and a half times the size of the biggest airplane ever built before. It will weigh 200 tons, as compared to the 82 tons of the Douglas B-19. Equipped with eight engines, it will be a flying boat. According to its specifications, it will carry 60 tons of cargo. It will have a fuel capacity of 8,000 gallons and a cruising speed



of 174 miles per hour. Its wing spread will be 320 feet and it will be 218 feet long, as compared to a wingspread of 212 feet and an overall length of 132 for the B-19. Three of these planes are being built, one to be completed for non-flying tests this winter.

The Kaiser cargo plane is shown above drawn to scale with the B-17 (wingspread 103 feet) and the P-47 Thunderbolt (wingspread 32 feet, 8 inches).

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JULY

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POPULAR MECHANIX ILLUSTRATED

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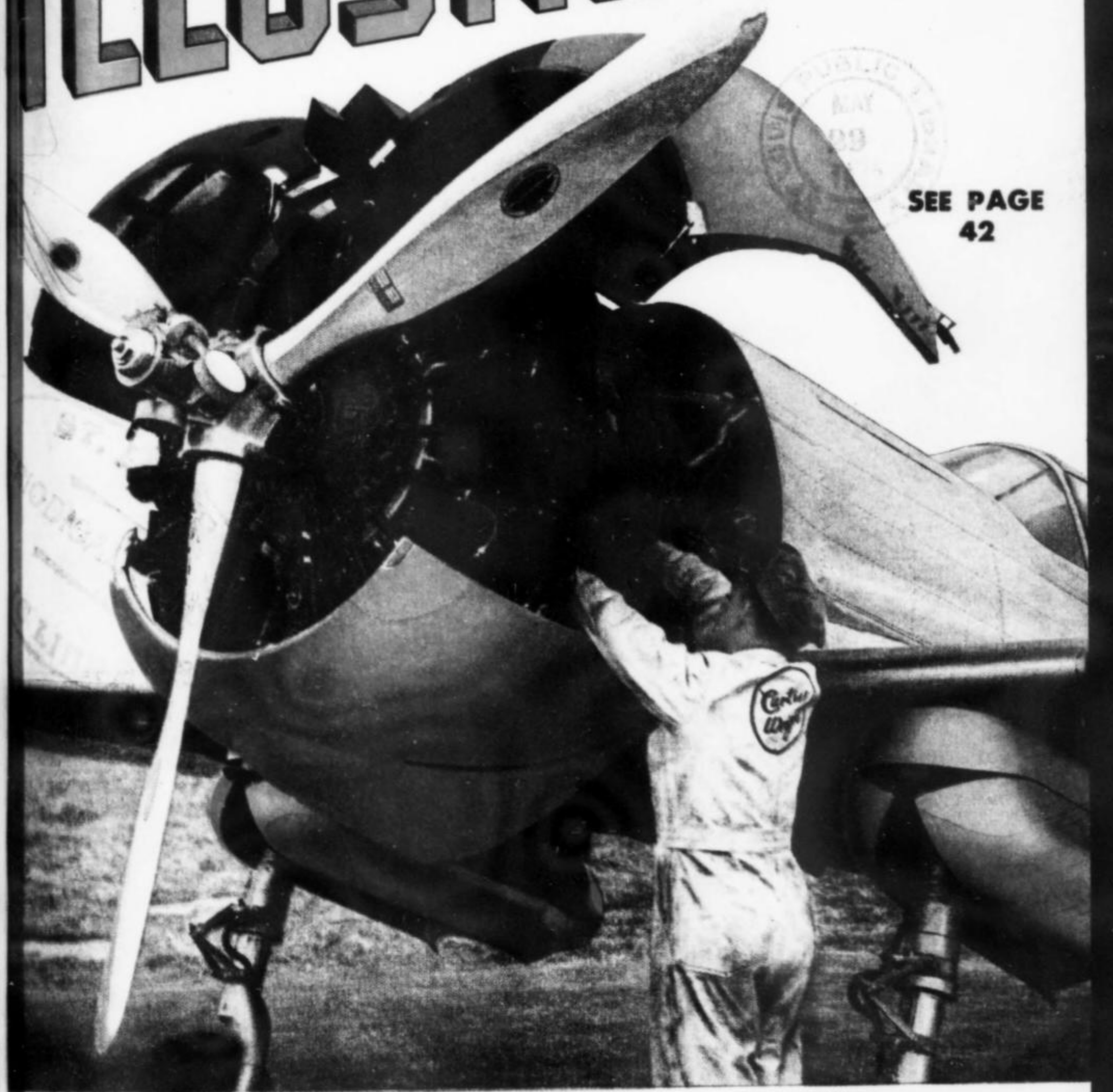

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MECHANIX ILLUSTRATED

JULY
1940

Volume XXIV
Number 3

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WHEN the National Soap Box Derby is run off at Akron, Ohio, this fall, we'll be looking for some MI readers to be up among the big winners.

Why?

Because the August issue will contain complete plans and instructions for building the MI Special Soap Box Racer, a streamlined, free-wheeling speed buggy that hits the hills like an eel on a greased slide and has a follow-through on the straightaway that is nothing short of a motorless miracle!

We're doing our part . . . the rest is up to you!

There will be plenty of other practical how-to-build projects besides the Soap Box Racer in next month's issue, along with a generous helping of interesting features, varied news shorts and photographic projects.

The new MECHANIX ILLUSTRATED is on sale at all newsstands the first of every month.

ROBERT HERTZBERG, Editor

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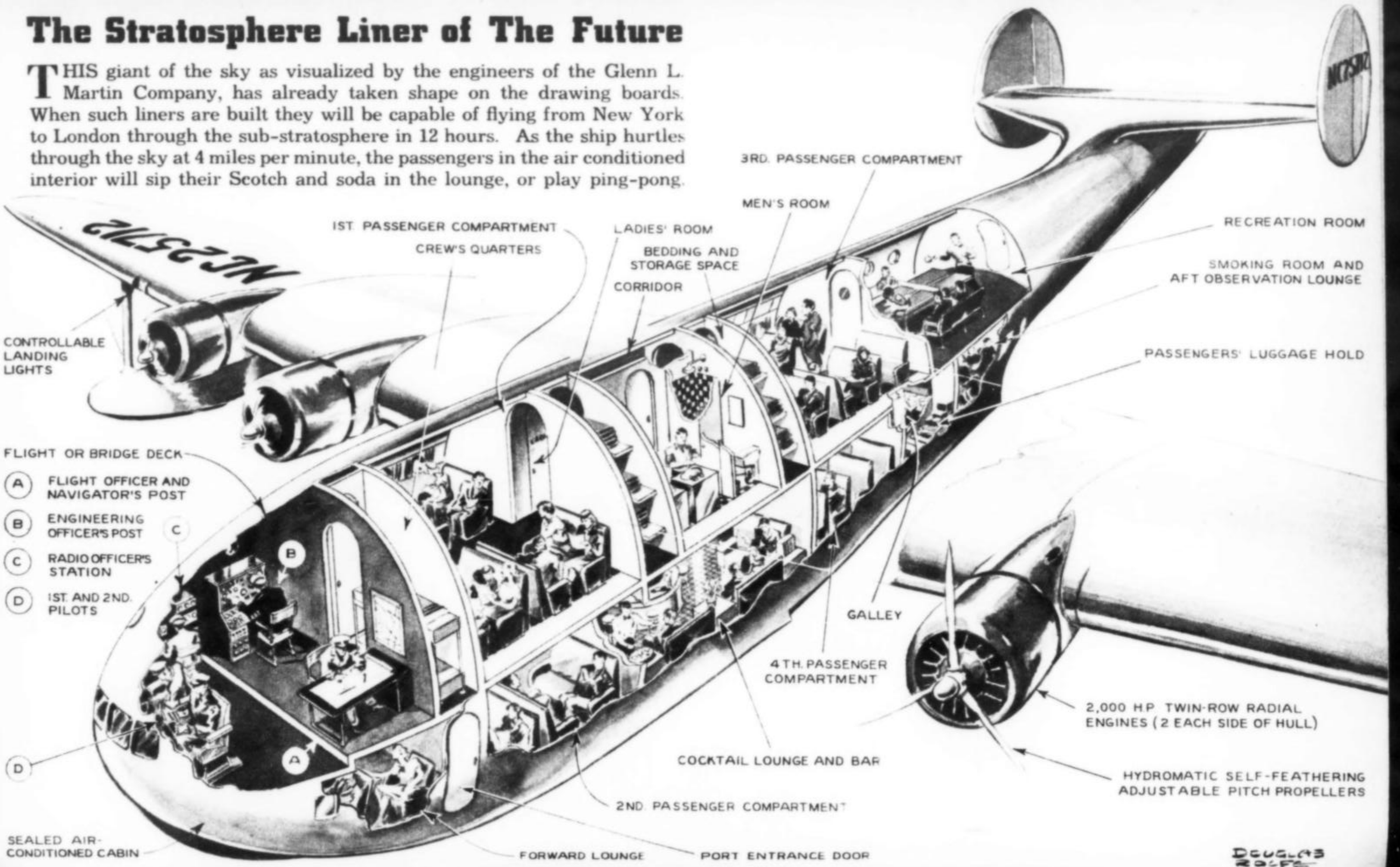
The Stratosphere Liner of The Future

THIS giant of the sky as visualized by the engineers of the Glenn L. Martin Company, has already taken shape on the drawing boards. When such liners are built they will be capable of flying from New York to London through the sub-stratosphere in 12 hours. As the ship hurtles through the sky at 4 miles per minute, the passengers in the air conditioned interior will sip their Scotch and soda in the lounge, or play ping-pong.



Football's Silent Man

COACH JIMMY CONZELMAN, of the

A Mere Sip Of A Girl

SEALED AIR-CONDITIONED CABIN

FORWARD LOUNGE

PORT ENTRANCE DOOR

DOUGLAS DC-6

Football's Silent Man

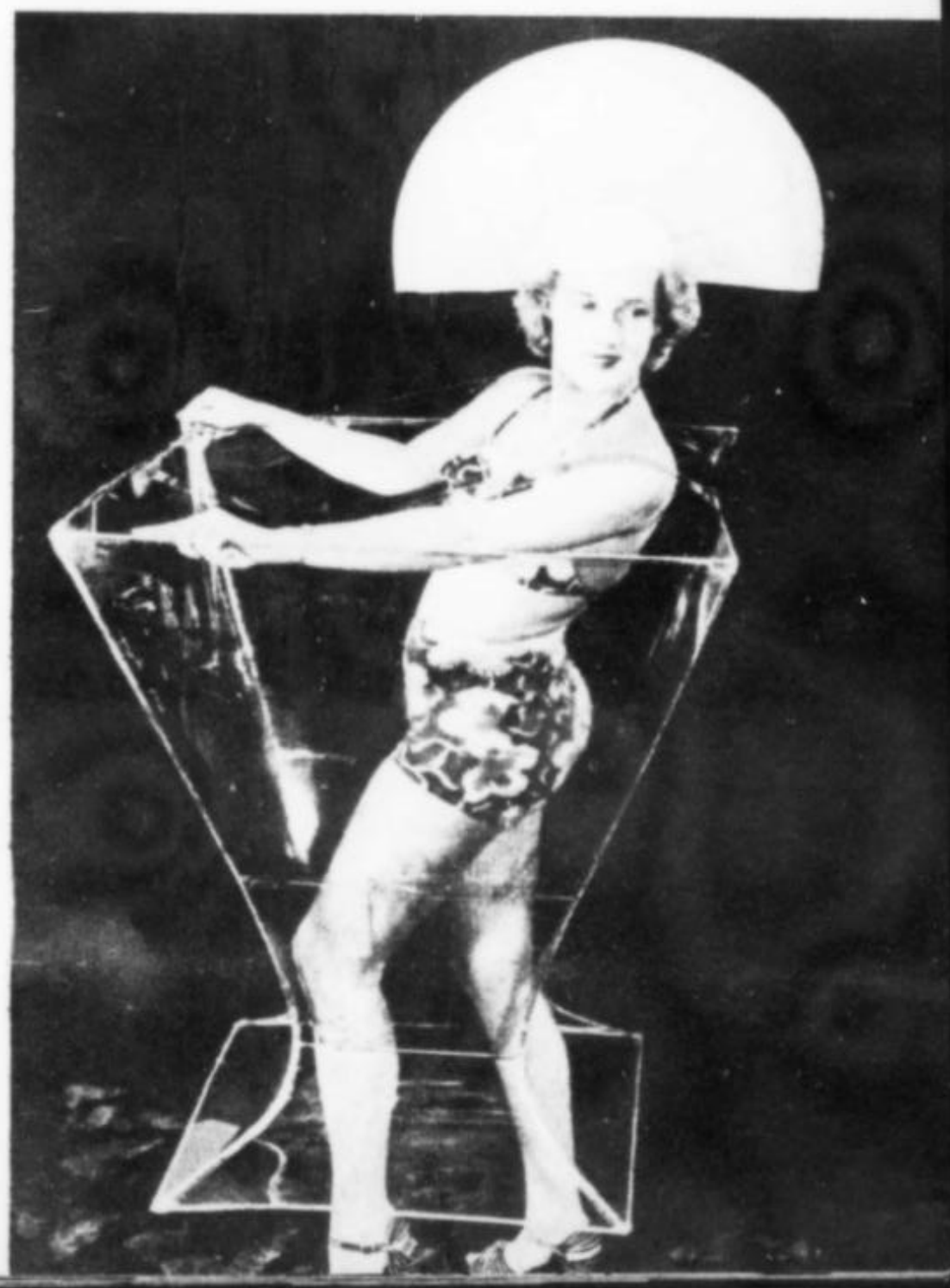
COACH JIMMY CONZELMAN, of the Chicago Cardinals, pats the massive chest of "Fightback" the new rubber tackle dummy. Rubber gentlemen of Mr. Fightback's family are expected to prove helpful in toughening players during pre-season practice. Note the large, soulful eyes.

Super System For Cereal

THE young lady in the picture is learning to eat her meals in aviation style with a dual control spoon. The object of the device is the duplication of the mother's hand motions by the child in eating. A mirror placed in front of the child enables the parent to watch the progress or check the machine's alignment if food goes astray.

A Mere Sip Of A Girl

CLAD in an over-sized plastic reproduction of the Rossi square vermouth glass, model Kay Williams appeared recently at the Mad Arts Ball. Miss Williams' escort was unable to get her into a taxi and was compelled to ship her in a truck. If the trend spreads to street clothes, pity the poor cabby.



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GRUMMAN F6F "HELLCAT"

FIRST PICTURES SEE PAGE 71

12 PAGES OF CHRISTMAS GIFTS YOU CAN MAKE

SECRET EYE OF THE EUROPEAN UNDERGROUND

MacARTHUR---MASTER OF AIR POWER

DEBUNKING THE TEST PILOT MYTH

DECEMBER 1943

MECHANIX ILLUSTRATED

VOL. XXXI NO. 2

Title registered U. S. Patent Office

W. H. FAWCETT, JR., President

Editors: Roland Cueva Bill Williams

Associate Editors: George Daniels, *Aviation;* Thomas J. Naughton, *News;* Gilbert Paust, *Crafts & Hobbies;* Mary Driscoll, *Production.*

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SPECIAL FEATURES

On the Cover: First kodachrome photograph released by the U. S. Navy of the new Grumman "Hellcat" (F6F), the Navy's speediest, most maneuverable fighter plane. For details see page 71. Kodachrome by Rudy Arnold.

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NEXT MONTH

The U. S. Signal Corps' documentary motion picture, Report on the Aleutians, is now showing in movie houses throughout America and is being hailed as one of the greatest movies thus far to come out of the war. It was filmed under tremendous difficulties, under fire, in fog and, in a great many instances, with improvised materials. The man who filmed the picture was Lt. Virgil Ellsworth. In a first person story in next month's MECHANIX ILLUSTRATED, Lt. Ellsworth tells you in his own words just how it was done. Everyone who loves an action story, and camera fans in particular, will want to read it. Reserve your January MI now!

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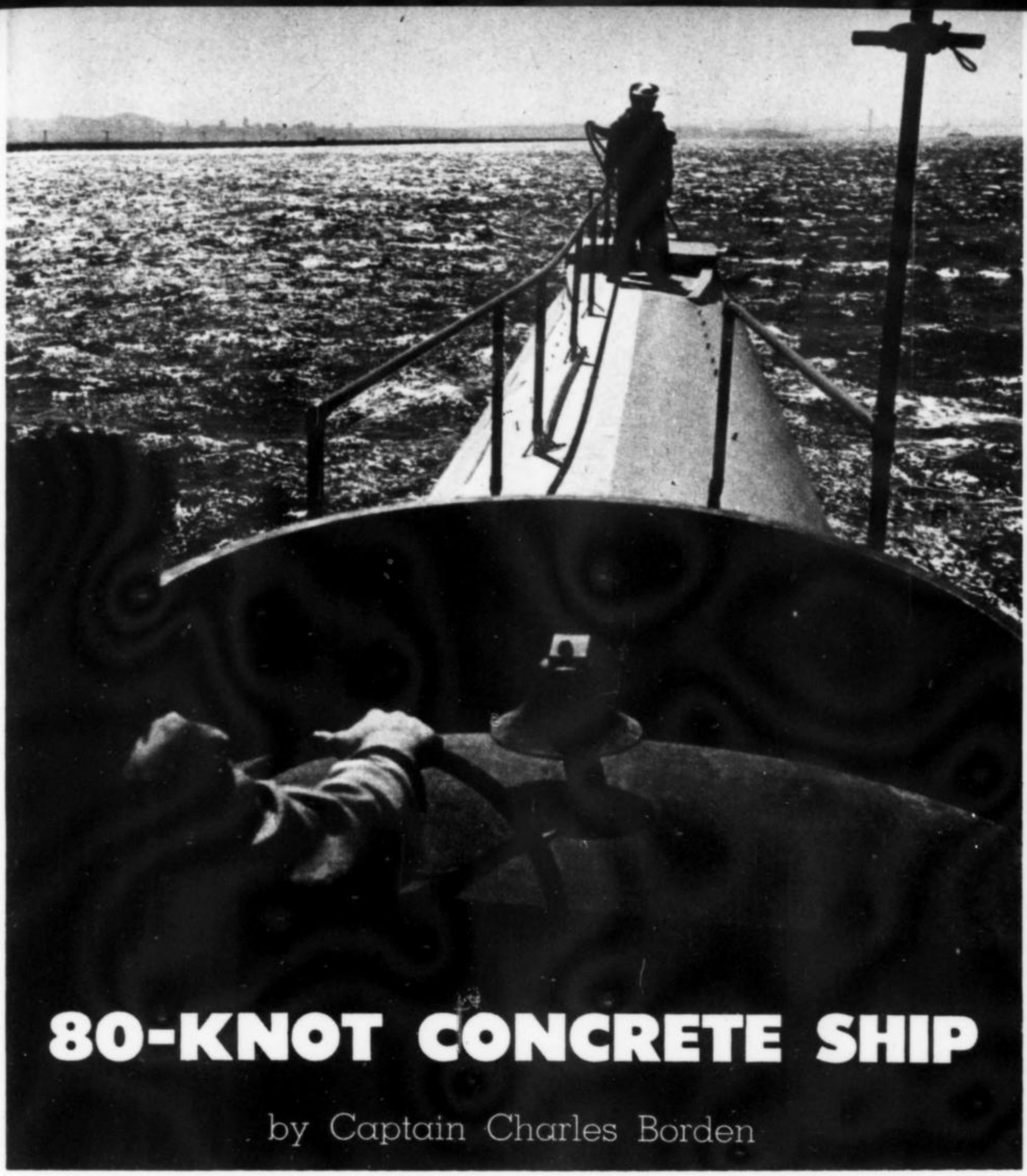
NAZI SECRET WEAPON

PREMIER WINSTON CHURCHILL, in a recent speech, revealed that the Nazis have introduced a secret weapon into the war. In Mr. Churchill's words, this weapon is a "radio-controlled, rocket-propelled glider bomb." Willy Ley, MECHANIX ILLUSTRATED expert on weapons, directed MI Artist Reynold C. Anderson in drawing the accompanying conception of this weapon. Mr. Ley brought the photograph (below) out of Germany several years ago. It shows a type of rocket glider perfected by the German inventor Reinhold Tiling [*Continued on page* 147]



80-KNOT CONCRETE SHIP

by Captain Charles Borden

The revolutionary new-type ship, Lektron, as viewed from its bridge on its test run.

THERE is a buzz of excitement among naval experts and representatives of the press, as Lektron, the torpedo-shaped submarineship travelling 70% submerged, knifes smoothly through the waters of San Francisco Bay at a spectacular rate of speed.

"It's incredible," an excited maritime official exclaims to a naval officer, as they crouch forward in the semi-conning tower of the strange new ship of the future.

Half-submarine, looking somewhat like a new Churchill cigar, Lektron is the forerunner of a fleet of 400 ft., cylinder-like freighters designed to travel at speeds up to 80 knots.

Built almost entirely of a secret, resilient aggregate and wire mesh, this concrete fantasy weighs but 22,000 pounds, is 124 feet long with a 7 foot beam. Costing over $80,000, it travels nearly three-fourths submerged when fully loaded, has a 5.000 mile cruising radius and space aboard for 55 tons of cargo.

Hal Hayes, the designer and builder, is a modest, likeable young fellow of thirty-one. Having built more concrete homes than any other builder in the world, he is known throughout the United States and in foreign countries to the builders who use his revolutionary concrete methods as the "Ford of the

Artist's version of a luxury cruiser of the future based on design of the new Hal Hayes Lektron idea.

building industry."

Sweeping aside the cobwebs of conventional marine design and shipbuilding, Mr. Hayes, with twelve years' experience in experimenting with and perfecting of concrete in ship construction, applied his knowledge to a design that would dispel the general notion that a concrete ship must be slow and cumbersome. The result is Lektron, the nearest thing to a perfect streamline that has ever been achieved in a sea-going surface vessel.

Adaptable as a freighter, tanker or troop transport, Hayes is making plans for a fleet of 10,000 ton concrete semi-subs designed for speeding troops and cargo safely across the ocean in torpedo-shaped hulls.

Have you ever tried to bend, bounce or stretch a piece of hard cement? Well, before you laugh at the question, just try to imagine a block of cement with such qualities that you can easily cut it in two with a common saw. Picture a slab of it that is nearly as light as wood and so pliant and flexible you can bend it into a complete circle as if it were rubber.

Seems inconceivable, doesn't it? But that's exactly what I saw inventor Hayes do with his rubbery concrete. He has, in fact, even used it in a set of truck tires, with fine results.

Although but one and one-fourth inch thick, the hull of Lektron has as much strength and is tougher than a four inch hull of cement generally used in ship construction. Pumice from the Mojave Desert makes Hayes' concrete 50% lighter than ordinary cement.

In an official examination by the Maritime Commission before it was ever launched the Lektron was subjected to the severest test that can be given a ship. It was blocked up on the extreme tip of each end. leaving no support whatsoever in the center.

One official openly admitted he expected to see it break in two, but the hull center never

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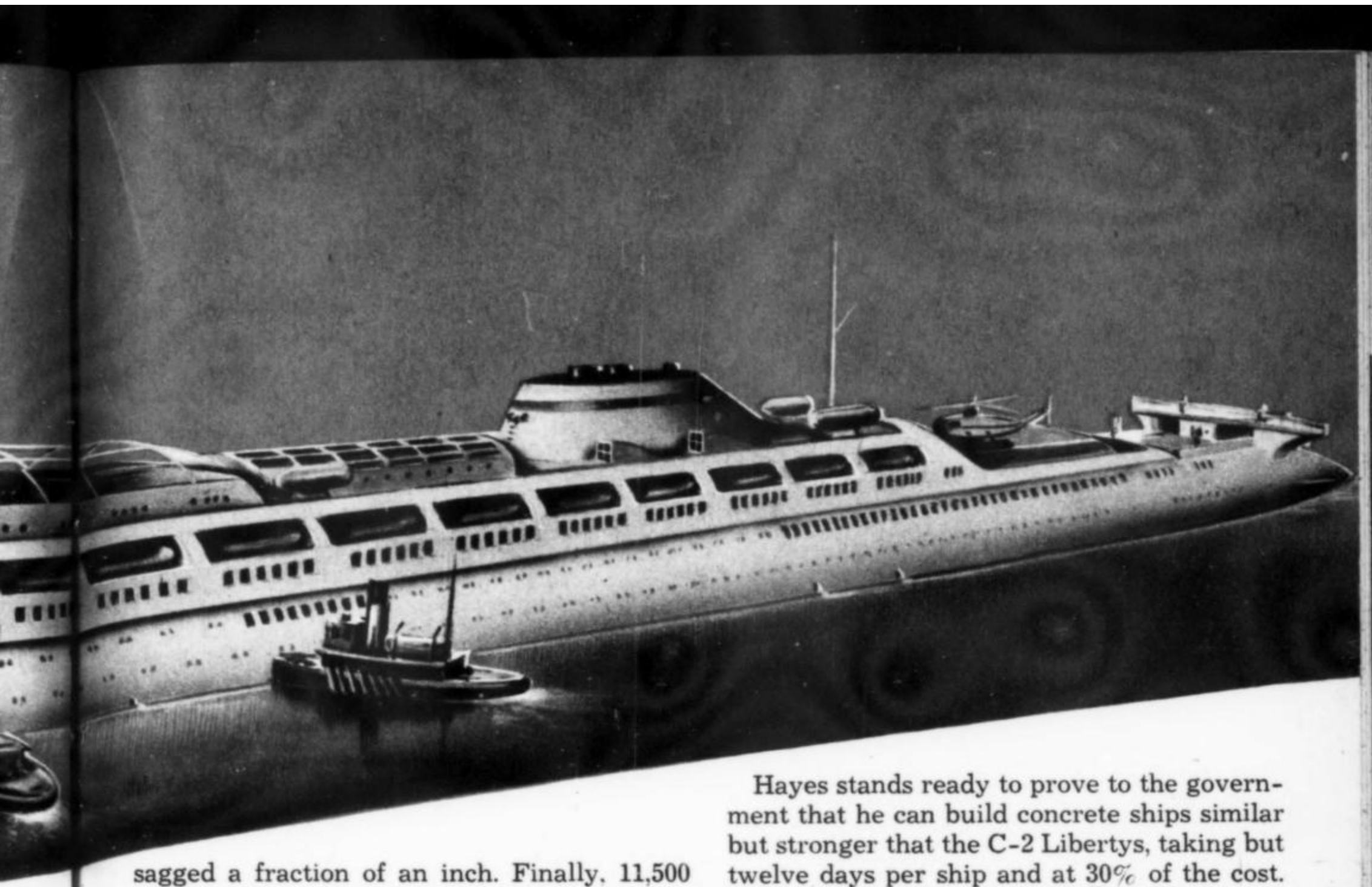
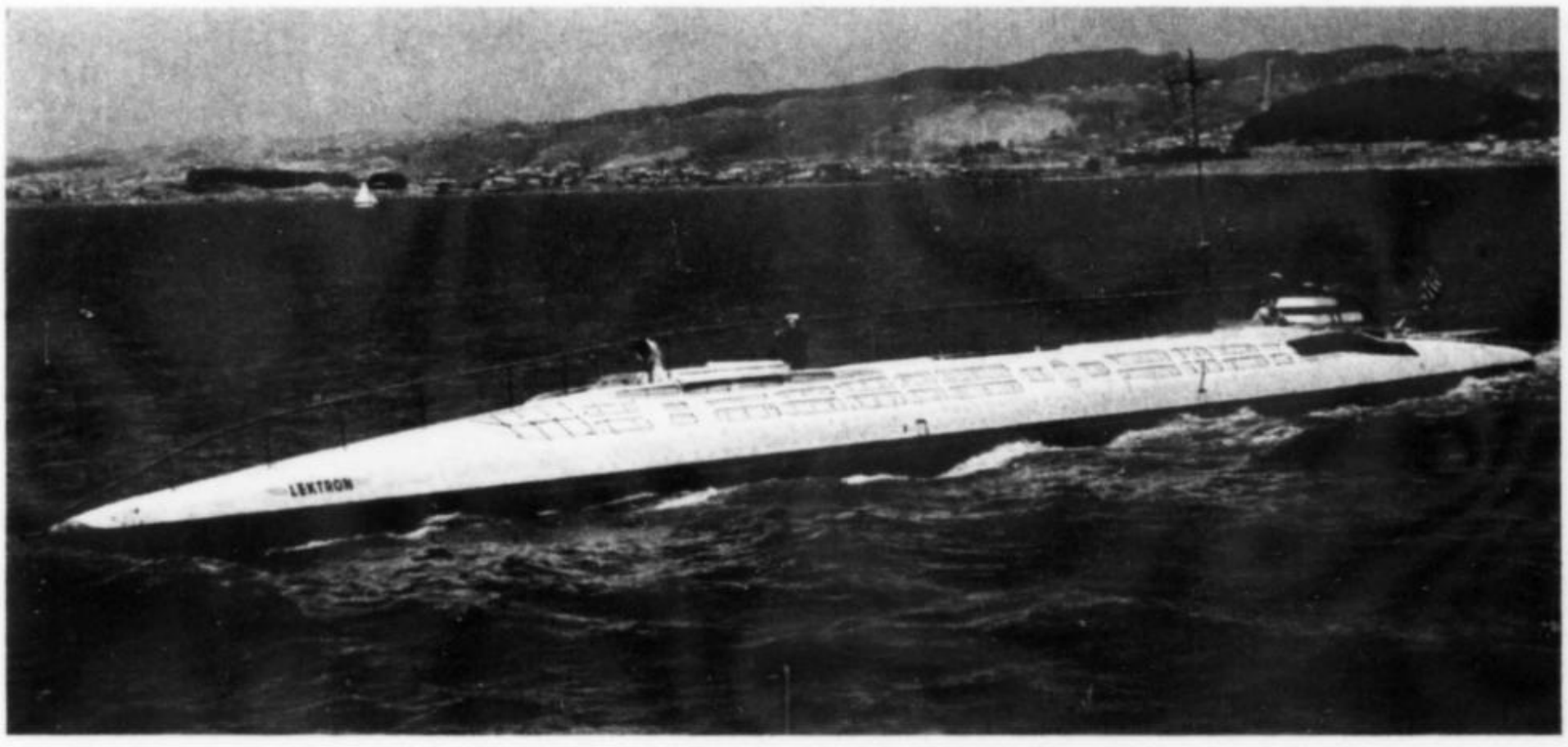
80-Knot Concrete Ship



sagged a fraction of an inch. Finally, 11,500 additional pounds (over one-half its own weight) was placed in the center of the vessel and it sagged but one-sixteenth of an inch and showed absolutely no checks or cracks. In comparison, if similarly tested, no Liberty ship being built today could hold its weight without sagging. Further in comparison, where a steel Liberty ship requires countless beams and girders to give its hull strength and to prevent its plates from buckling, Lektron's amazing strength is wholly in the concrete hull, having no bracings, beams or hull supports whatsoever.

Hayes stands ready to prove to the government that he can build concrete ships similar but stronger that the C-2 Libertys, taking but twelve days per ship and at 30% of the cost. He'll use mostly unskilled labor and only one-tenth the precious metal required in a Liberty ship. Much stronger than the Libertys, by eliminating built-in stresses, they would travel twice as fast, carry twice as much cargo and, built in three sections, would stay afloat even if two sections were destroyed. Having no seams or rivet holes, they would be practically leak proof. (A concrete ship still in service on the Pacific Coast has not once in twenty-two years of coastal sailing found it necessary to use a bilge pump.) And where a steel ship would buckle and sink if afire the

The Lektron takes off on its test cruise—furnishing a basis for the futuristic ship above.



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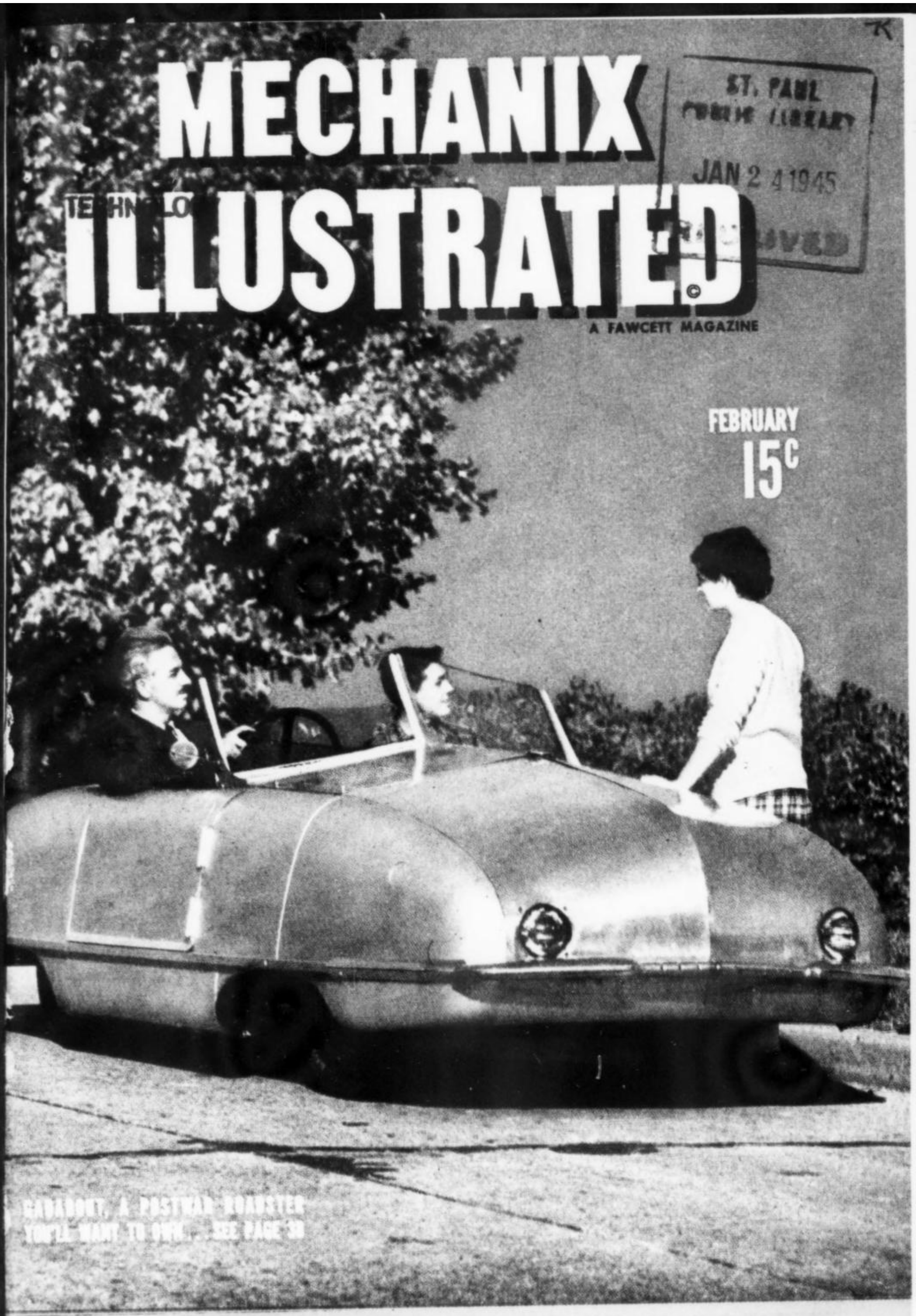

RED ARMY DOCTORS REVIVE THE DEAD

48 PAGES OF HOBBY AND WORKSHOP ARTICLES

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FEBRUARY, 1945 **VOL. XXXIII NO. 4**

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On the cover: *Kodachrome of Runabout designed by Ray Russell*

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Gadabout

A SPORTS CAR FOR TOMORROW

Weighing 1,100 pounds, making 50 miles to a gallon, the Gadabout's the answer to motorists' prayers.

by Orrin Wright

WHILE most of us are sitting around dreaming of the day when we can buy all the gasoline we want, and wondering what the 194? models will look like, Ray Russell of Detroit has done something really tangible about the "car of tomorrow."

Russell, designer, automotive engineer, inventor, artist, sculptor, color expert, musician, photographer—the list is interminable, or so it seems—has designed and built a revolutionary small car which he believes will have an important place in private transportation after the war.

The "Gadabout," as Russell has named his new creation, is a three-passenger, lightweight model of standard width but short (80-inch) wheelbase, designed specifically for use around town or on short trips.

Russell's principal job these days is designing new models for some of the country's largest automobile manufacturers. When he started out to create the Gadabout, he brought to the task years of experience in the automotive field, both in designing and in engineering. He is a member of the Automotive Engineering Society.

He brought also an immense energy, which has enabled him to achieve phenomenal success in a dozen different fields, any one of which would tax the energy and ability of most men. While he is a man of many parts, his chief love is the automobile and his lean, intelligent face fairly lights up when he discusses his plans for the car of the future.

Russell got the idea that light metals, such as duraluminum and magnesium, which are so widely used in airplanes, should be a great help in building lighter cars. He figured that weight also could be cut down by eliminating such leftover features of the "horse and buggy" days as separate fenders, running boards, high-mounted bodies, etc.

You can't build new engines or chasses for automobiles these days, so first off he got hold of a British MG four-cylinder standard type motor and chassis. Over this framework

he constructed a body of duraluminum, which he obtained in the form of scrap from airplane factories.

The body, which has smooth contours, extends over all four wheels. There is no standard type "potato box" hood. The body slopes gently from the center to each side in unbroken lines, then drops vertically in an apron which covers the wheels and extends along the full length of the body on each side. The apron also extends in curved shape around the front and rear, giving unbroken lines completely around the car.

The lights are set flush with the front. The front and rear sections of the body are similar, and the only break in the flowing lines is the seat and windshield in the center.

The Gadabout's dashboard, with safety pads. Drive's on right because model was built on British chassis.

For mass production of the Gadabout, Russell recommends body sections of aluminum alloy sheet stock formed in a metal stretching press, such as is used in forming many airplane parts. The die cost would be very low since the body would be stamped in four sections, with the right front and left rear sections, and the left front and right rear sections interchangeable.

In the production model, a metal stamped floor would replace the old-style chassis frame. Thus the only body dies needed would be for the four corner sections, the floor and the two doors. Elimination of the chassis frame would cut down weight. A steel tube around the entire body at bumper height gives protection as a crash pad.

The Gadabout, which Russell built in his own workshop at his home in exclusive Grosse Pointe Park, a residential suburb of Detroit, weighs 1,100 pounds, just about a third of the weight of today's medium-priced cars. It makes 50 miles to the gallon, uses standard-sized tires and is very easily handled.

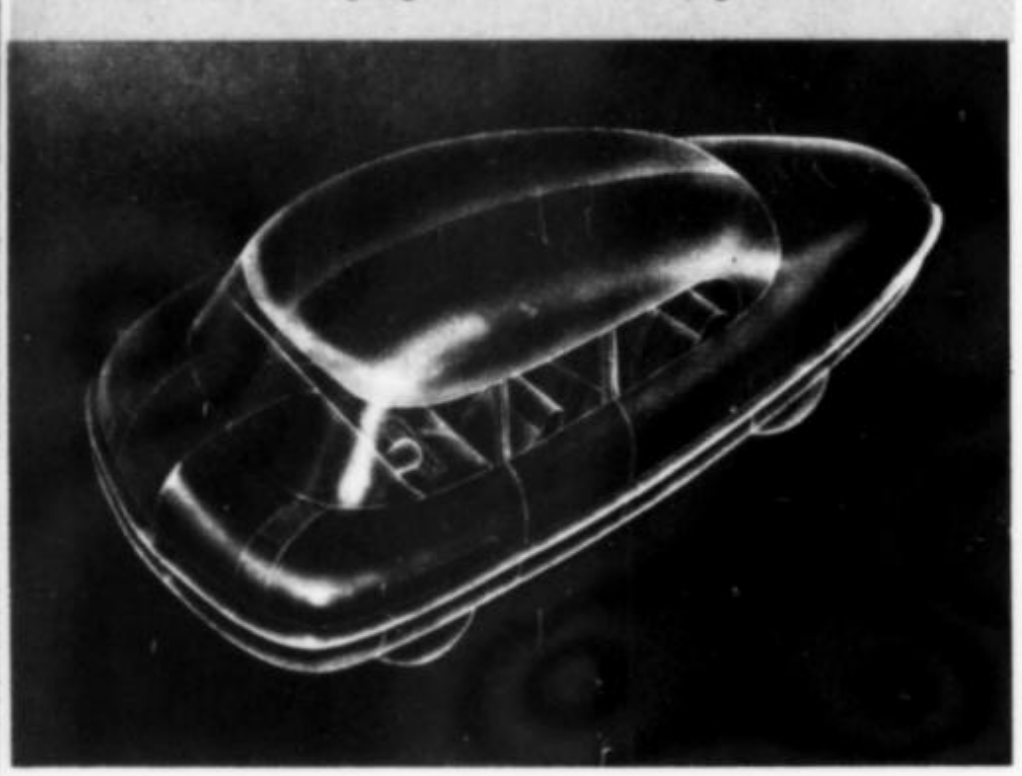
Russell plans a number of improvements in the little car when it goes into production. For one thing, he recommends a two-cycle motor with direct fuel injection and an exhaust-driven turbosupercharger which aircools the motor internally. This type of motor, especially adaptable to a light car, gives great fuel economy and has a high ratio of power to weight.

Incidentally, Russell believes the Gadabout should not have a speed greater than 50 miles an hour. He feels the car is ideal for shopping trips, driving to work and school and for other uses about town. He says it will be particularly apt for families which require two cars, and for young people.

Many people have asked Russell why the righthand drive in the Gadabout, but he says it has no significance and that the production model will have a standard lefthand drive.

Designer Ray Russell at his drawing board. Cars aren't his only interest; he sculpts and paints, embosses book covers, designs radios and pianos.

The Cross Country Amphibian, another Russell brainchild, is designed with four-wheel drive that shifts to propellers for fording streams.



Russell's idea for a Town and Country car. Design calls for air-cooled rear motor, full driver vision, insulation of body against all noise and vibrations.

The motor, by the way, could be placed either in the front or rear, as preferred. Russell believes the rear is the logical place.

In the Russell living room a quick glance reveals a marimbaphone and a piano, both of which Russell plays; a large drawing board with a partly finished sketch of a streamlined automobile; a corner filled with pieces of sculpture of various kinds and sizes, definitely the work of an expert; numerous oil paintings on the walls, all done by Russell, and a desk covered with plastic items, electrical tubes, designs, dial faces, etc.

As for Russell himself, he's slender. of medium height, with a well-tanned, rather intense face. His pleasant brown eyes and ready smile, plus a close-cropped, dark mustache give him a very youngish look, despite an unruly thatch of gray, almost white, hair. He is 47, looks much younger.

Get the discussion around to music and you find that Russell, in addition to the marimbaphone and piano, also plays the saxophone and trap drums. In fact he paid much of his way through school as a dance band drummer, and later played in dance bands in many parts of the country. He made money by painting signs, too.

Russell was born and reared in Wilmington, Dela., and worked for the duPont company there for many years. He attended the Chicago Art Academy and later studied sculpting in Detroit under Simone. He has sold a number of sculptured pieces.

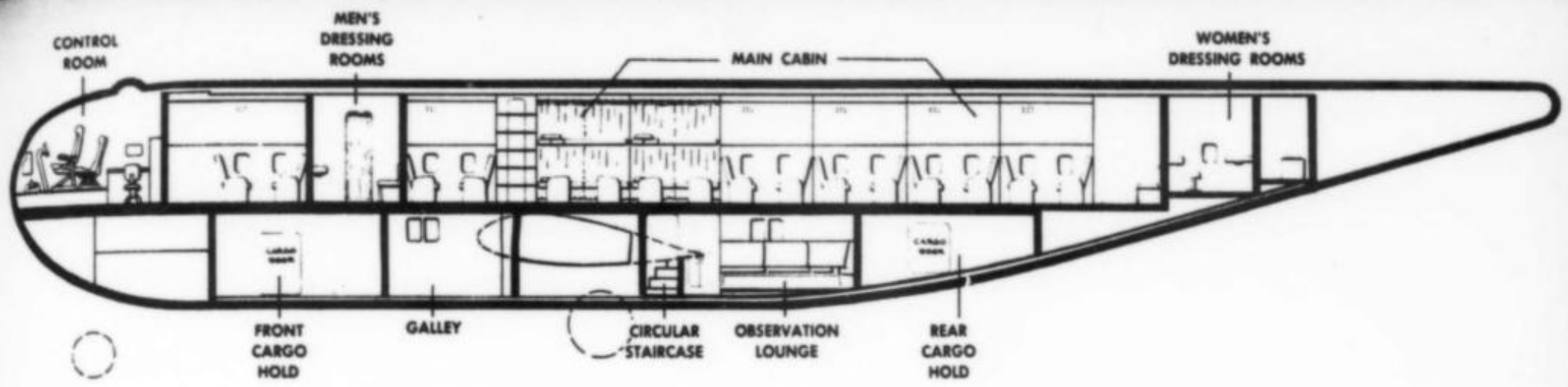
Just ask Russell what other interests he has, and you may find yourself in a discussion of silversmithing, which he studied at Cranbrook. Or art. He is a member of the Scarab Club, a society of Detroit artists, and has exhibited paintings and sculpture at the Detroit Art Institute and the Scarab Club. Or photography. He is an expert, and has set up many photographic exhibits to aid in automotive advertising campaigns. He was president of the photographic section of the Scarab Club for a couple of years.

Take a look at the chair you're sitting on. If it's a Grand Rapids product, Russell may have designed it. He also has designed radios, modernistic pianos and gas ranges. Have you a book with an embossed cover handy? His process for embossing book covers is widely used. He is vice-president of The Burkhardt Co. of Detroit, book binders.

There are his inventions, too. Articles currently on the market, on which he holds patents, include an improved camera stand, plastic goggles, plastic coat hangers and a number of other plastic items. The army, not overlooking any good bets, has employed Russell extensively in work of a highly secret nature during the war. He has done much important work in black-light photography for the army.

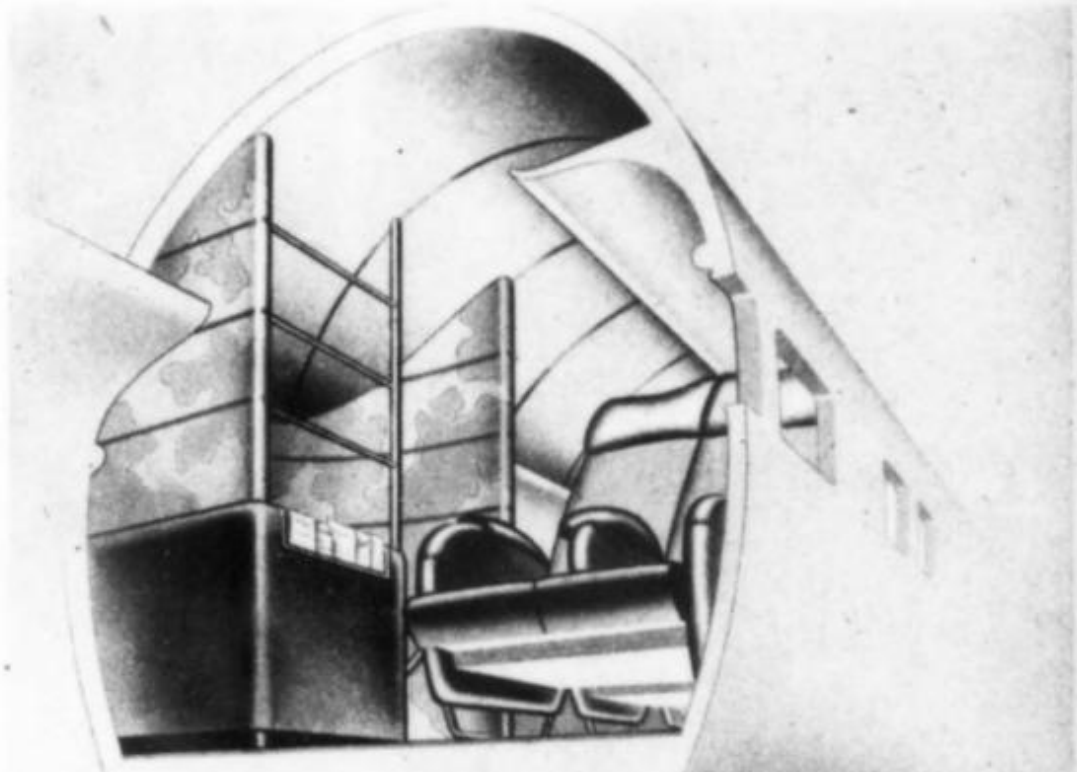
Perhaps next to designing, one of the principal interests of this amazing man is the science of color. Several years ago he developed a 12-cycle color formula which has been the basis for the production of some 5,000 separate colors and hues and has played an important part in modern color engineering. He also has designed the colors used in many a modern car.

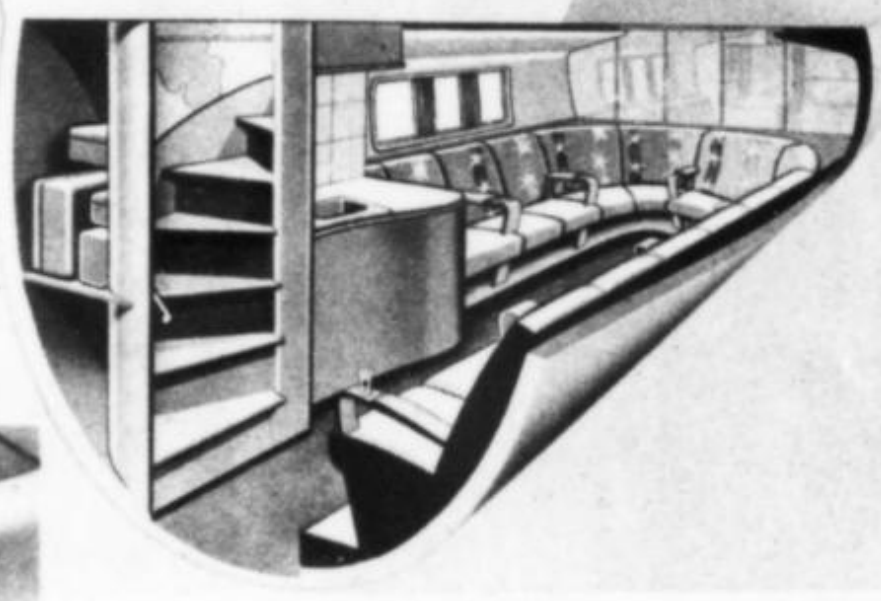
But Russell's principal job right now is getting ready for the day when the government gives the "go ahead" sign to the automobile makers. Right now he is working on designs of postwar cars for four big automobile manufacturers.



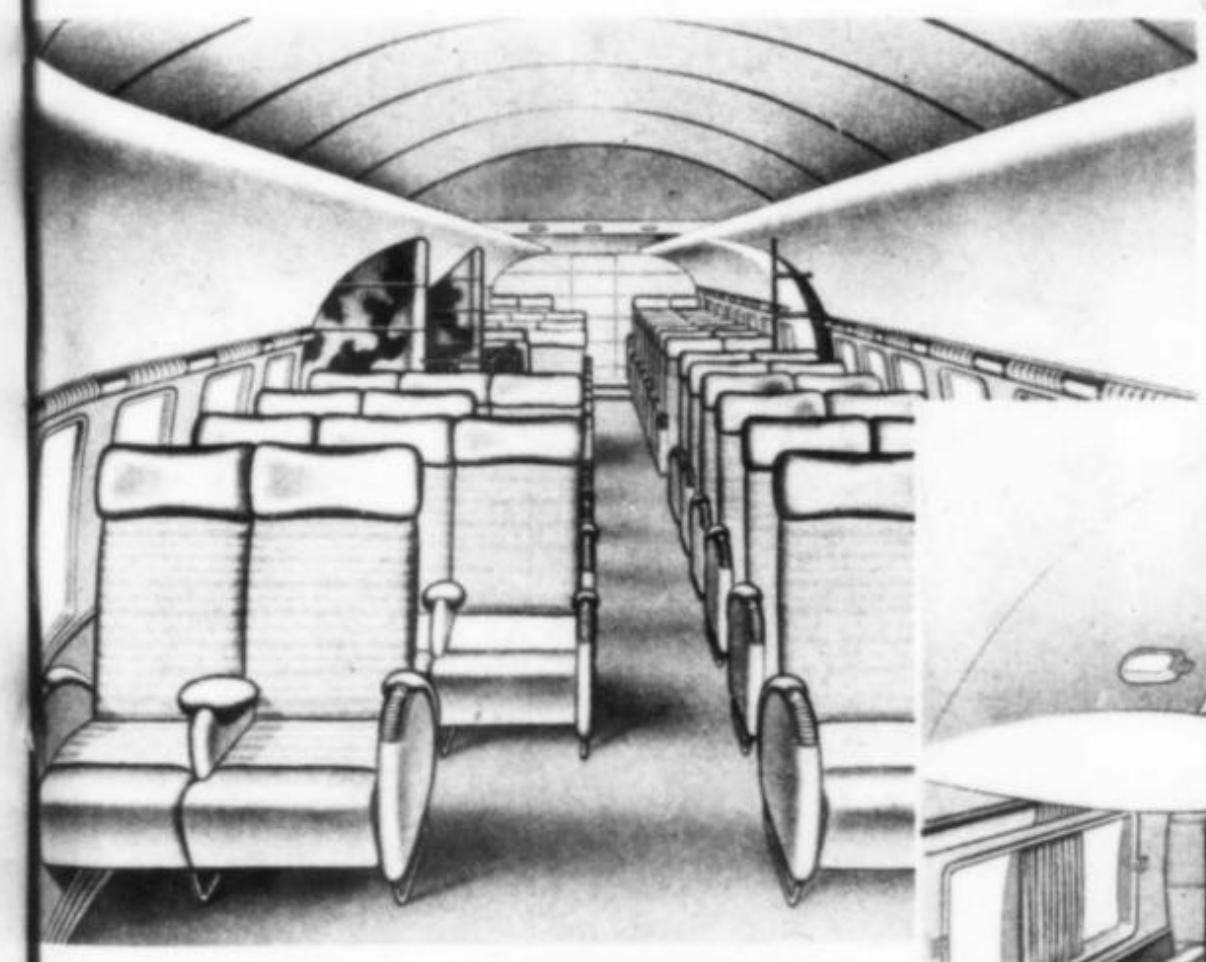
AERIAL GREYHOUND

THE Boeing-built B-29 Superfortress served as the model for the new luxury transport, the Stratocruiser, which the maker announced recently. With a top speed of 400 MPH and a cruising speed of 340 MPH, the ship is the fastest airliner now planned. Direct operating cost will be only 1c a mile, the lowest yet. It will be built in three models, one a 100-passenger low fare dayplane transport, another a sleeper plane with 36 berths and seats for 72, and the third an all-cargo transport with 17½ ton capacity. The four giant engines will develop 3500 horsepower each at take off. The 35-ton plane will have a wing span of 141 feet.

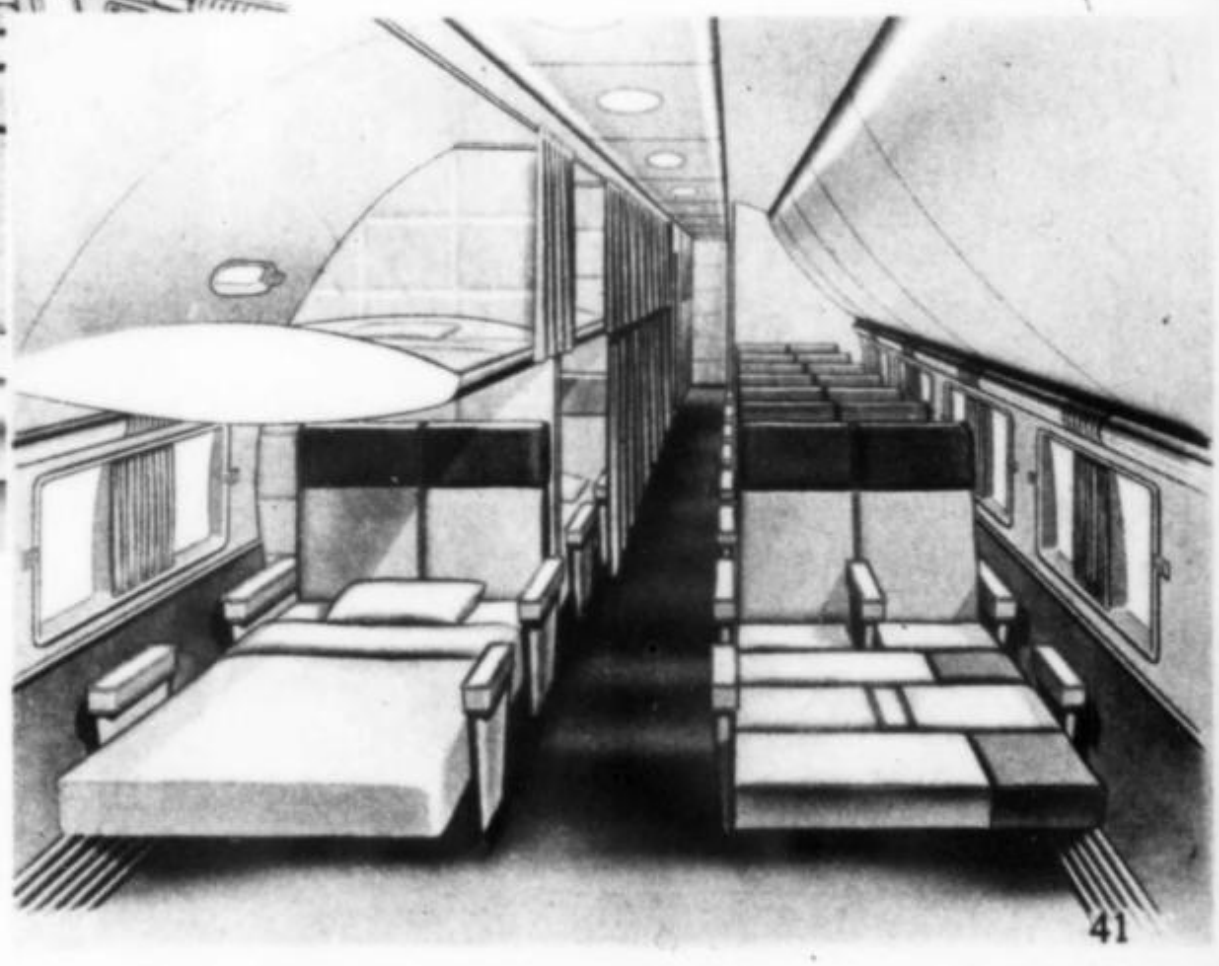




Top deck 72-coach-passenger compartment will be connected by circular staircase with a 14-passenger lounge on the lower deck.



Main cabin of 100-passenger day-coach model. Both cabins are pressurized for 340 MPH cruising speed at 30,000 feet.



Night sleeper version of Stratocruiser has 36 berths. Plane has range of 3,500 miles and low operating cost of 1c per mile.

Over the Edge

by W. M. Kimball

Exploring the region of mist and screeches—the space where "you see the tips of angels' wings."

"AT GREAT personal risk, he knowingly entered into unknown regions."

Thus reads one of the most unusual Distinguished Flying Cross citations awarded in this war. The D.F.C. went to Lieutenant Colonel Cass Hough and he won it for exploring a truly unknown region—a region more terrifying than the awesome mysteries of Africa, more dangerous than the South Polar Cap, full of stranger threats than airmen ever met before.

Colonel Hough's unknown region has a name—a technical name—but it is spoken of with fear by flyers as "Over the Edge." It is such a region as might have been invented by imaginative writers of weird tales, or conceived in "The Time Machine."

The region "Over the Edge" is found in the sky. It is not bounded geographically, as other unexplored places are. There is no coast on one side, no river, no range of mountains to mark it off or make it visible. It is bounded by time, by motion through space: in a word—by speed. By the tremendous speed of sound, to be precise, and by a set of physical laws which are not yet found in books on physics.

It is a region where "an angry giant lives"; a region of frightening roars and screeches, of mysterious mists—"where you can see the tips of angels' wings," as one who survived it swore.

Flyers have been aware for four years of the region found "Over the Edge," but only now will censorship permit even partial public discussion.

The region was discovered in 1940 by Colonel S. A. Gilkey, testing officer at Wright Field, Ohio. He was piloting one of the first twin-boomed P-38 Lockheed Lightnings when he dived unknowingly "Over the Edge."

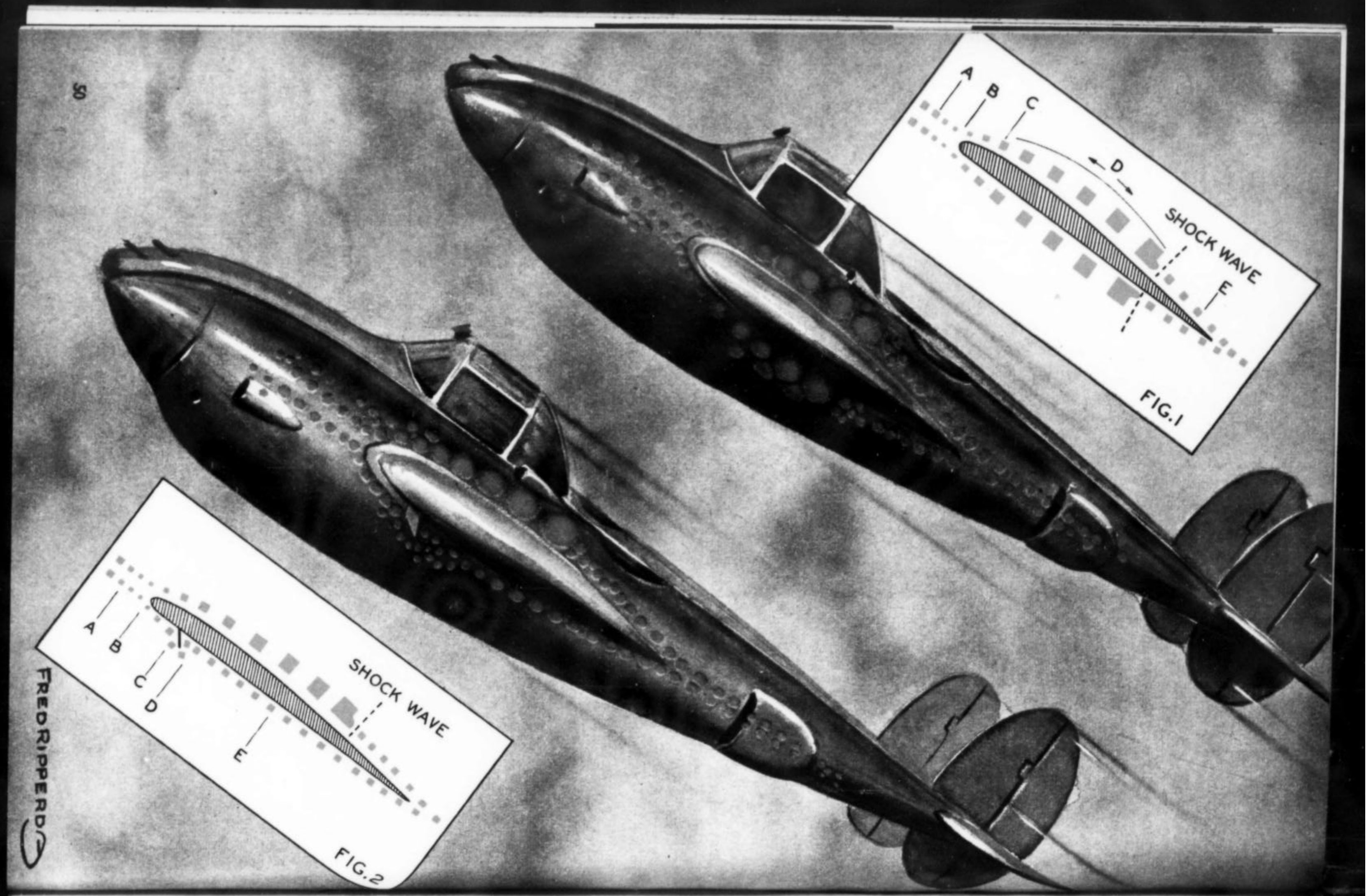
The P-38 was cruising at about 30,000 feet when Colonel Gilkey, following his test schedule, turned its nose down in a power dive. At first the descent was normal, but the craft, speeding earthward faster and faster, suddenly began to pitch and yaw as if it had plunged into some medium other than air.

It seemed as if a drunken giant had seized the nose and was drawing it relentlessly to crash. The Lightning, known to "climb like an angel," had literally begun "to go down like the devil."

The colonel desperately fought the controls. They would not respond—had gone mushy. Then they began to freeze tight. But somehow, after he summoned all his experience and after thousands of feet were spent, the controls began to take hold and the bucking plane pulled out. Colonel Gilkey was lucky.

On the ground, he said: "I don't know what it was, but I got the hell out of there!" He was aware that he had fallen over the brink of a strange and overpowering new region of the sky.

Not long afterward, a student flyer took a P-38 to 35,000 feet and half-rolled it into a dive. His mates on the ground, stunned, could do nothing but watch as the plane screamed



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MECHANIX ILLUSTRATED

A FAWCETT MAGAZINE

JUNE

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World's Largest Airliner
Model 37 to Carry 204 Passengers

7TH WAR LOAN ☆ SEE PAGE 160... A LETTER TO YOU FROM THE GENERALS OF THE ARMIES AND THE ADMIRALS OF THE FLEET ☆ BUY BONDS!

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JUNE, 1945

VOL. XXXIV NO. 1

On the cover: *Kodachrome of Consolidated-Vultee's model of largest airliner yet designed*

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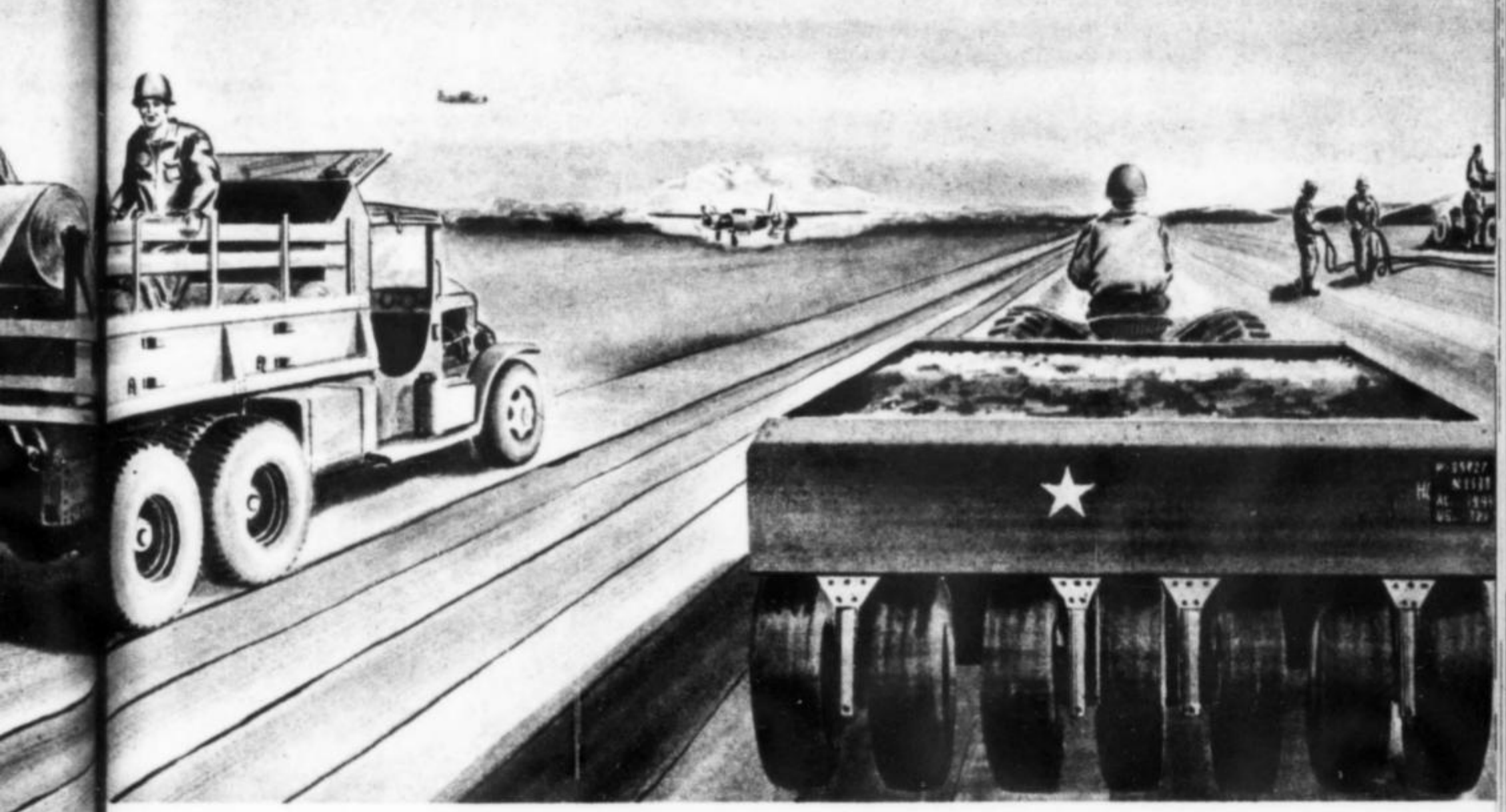
ROLL OUT THE BURLAP!



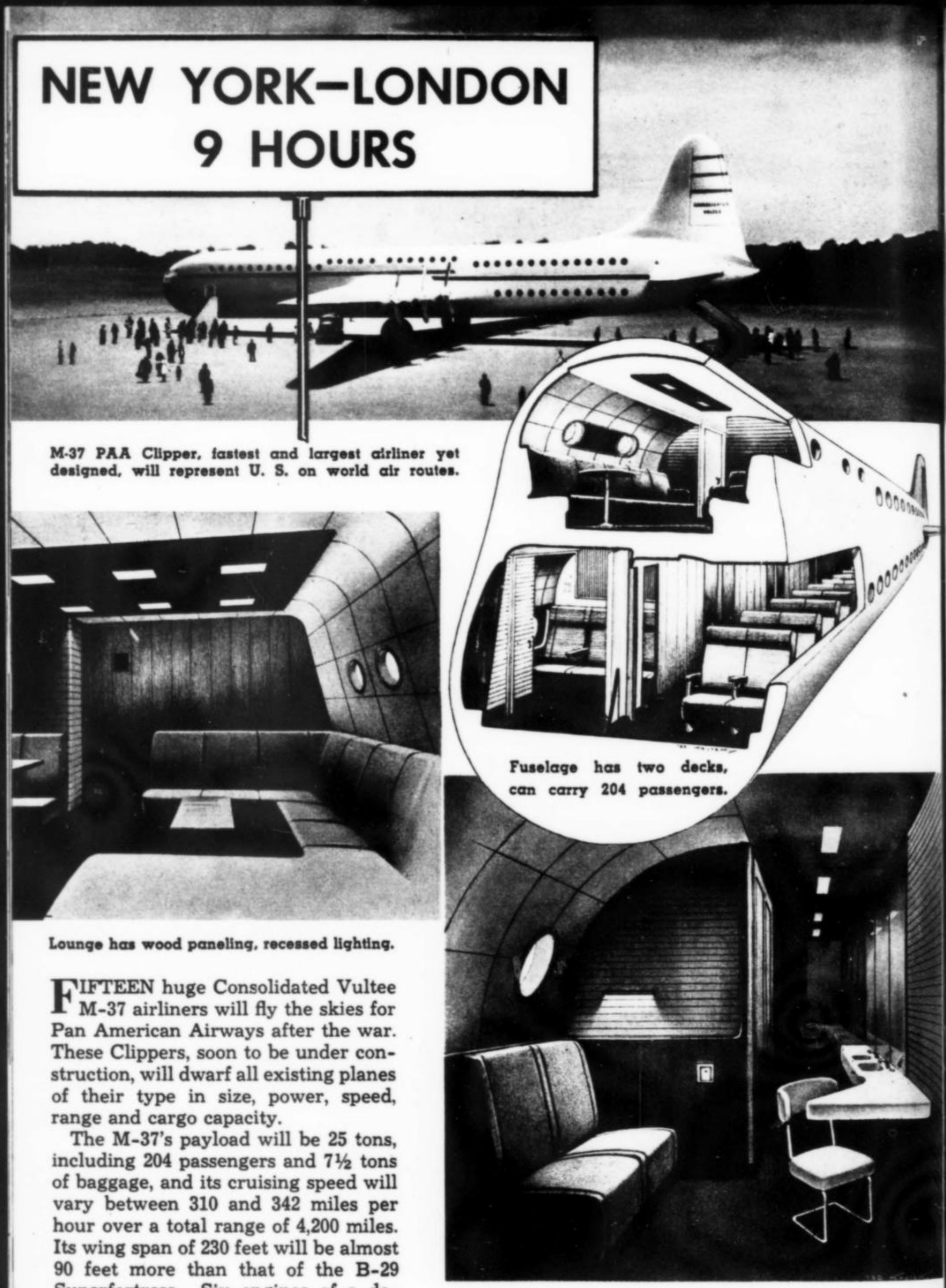
by Gilbert Paust,

MI's Aviation Editor

The "stamplicker" rolls out long strips of coated burlap to form the latest in synthetic airstrips, the U. S. Army's "Hessian Mat."

A FACTOR in Allied victories on the Western Front has been the availability of airstrips for our fighters directly behind the battle lines.

Thanks to a new type of mat which resembles tar paper, Army engineers have been able to lay these emergency fields in record-breaking time. When a location suitable for an airfield has been rolled and graded, a device known as a "stamplicker," towed by a truck, rolls over it strips of burlap material called "Hessian Mat." These rolls are 100 yards long and 36 inches wide. As they pass through the rollers [*Continued on page* 145]



M-37 PAA Clipper, fastest and largest airliner yet designed, will represent U. S. on world air routes.

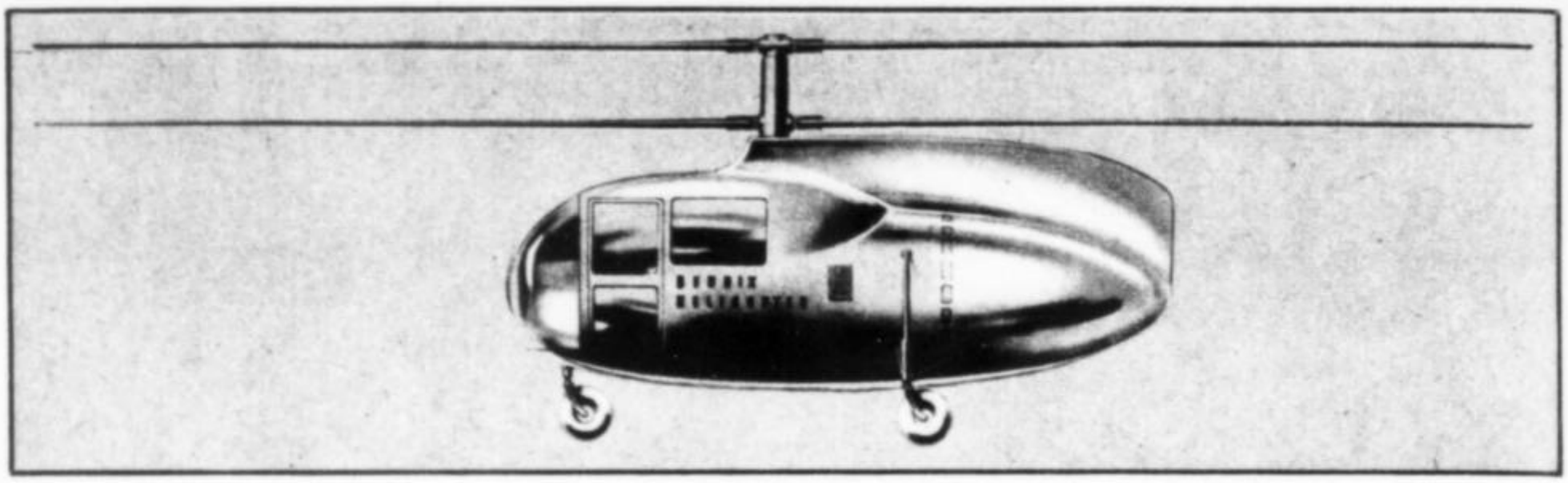
Fuselage has two decks, can carry 204 passengers.

Lounge has wood paneling, recessed lighting.

Restrooms on upper deck have luxurious appointments.

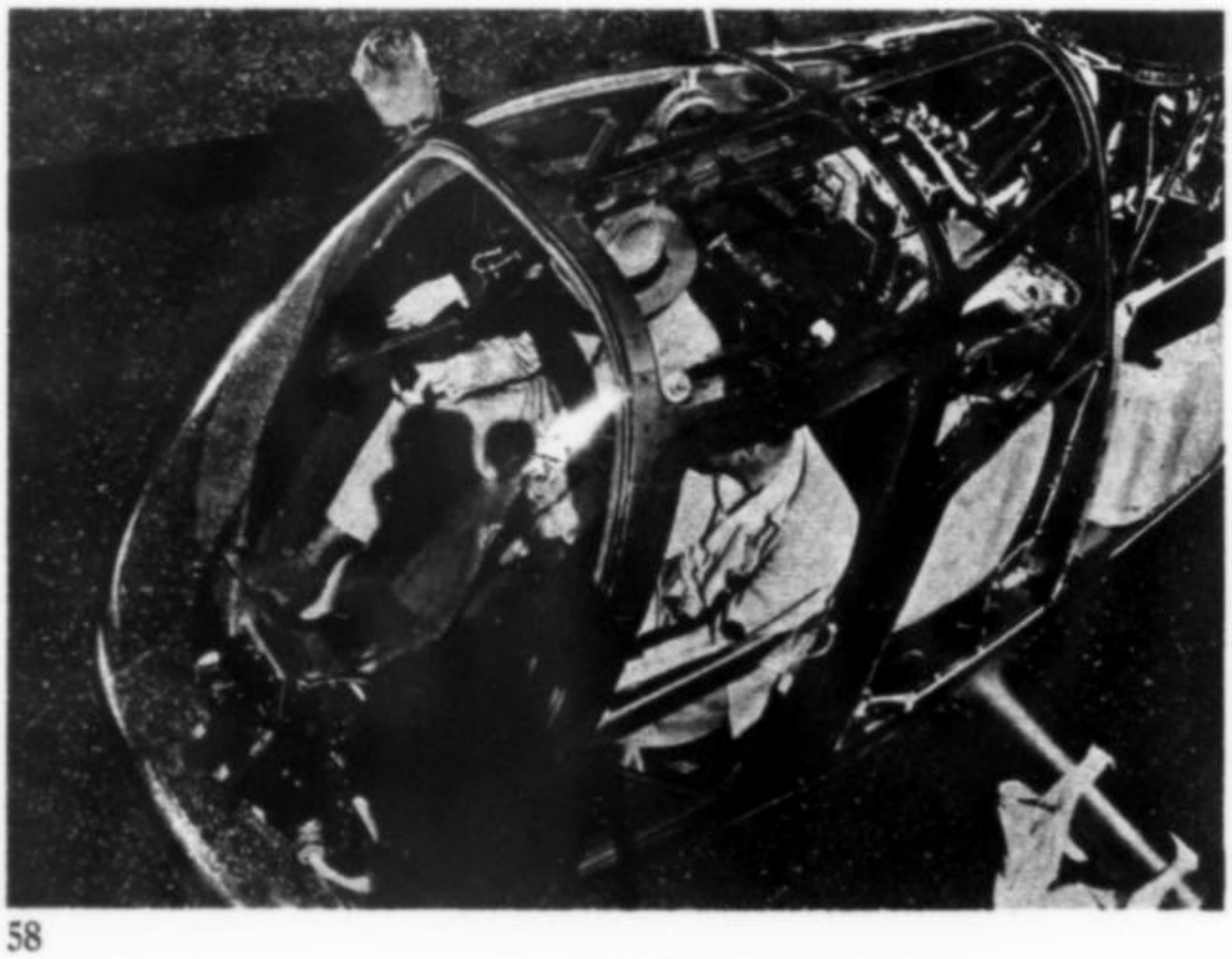
FIFTEEN huge Consolidated Vultee M-37 airliners will fly the skies for Pan American Airways after the war. These Clippers, soon to be under construction, will dwarf all existing planes of their type in size, power, speed, range and cargo capacity.

The M-37's payload will be 25 tons, including 204 passengers and 7½ tons of baggage, and its cruising speed will vary between 310 and 342 miles per hour over a total range of 4,200 miles. Its wing span of 230 feet will be almost 90 feet more than that of the B-29 Superfortress. Six engines of a design now [*Continued on page* 144]



Co-Axial Rotors, as on the Hiller-copter illustrated in the December MECHANIX ILLUSTRATED, eliminate noise and vibration on this new helicopter designed by Vincent Bendix. The inventor claims it will be easier to operate and safer than an automobile. Two levers control the machine's flight, and continuous autorotation makes it possible to fly it with safety at altitudes of only 100 to 200 feet.

First Jet-Powered helicopter is Antoine Gazda's "helicospeeder." Propelled and steered by jets, the machine has more speed, weight-carrying capacity, stability and controllability than the ordinary plane of its type, says the designer. The unorthodox construction omits the usual auxiliary rotor fixed at the tail of other helicopters to counteract torque. Perhaps this will be your postwar air "flivver."



Heli-Cabin. First closeup of the control cabin of the new R6 Sikorsky helicopter shows almost 100% visibility achieved by transparent plastic construction. The 3-blade rotor type machine has a tip-to-tip diameter of 38 feet. Tail rudder measures 7 feet across. The gross weight is 2,600 pounds, the speed exceeds 100 m.p.h., and it can climb 4,000 feet in 7 minutes.

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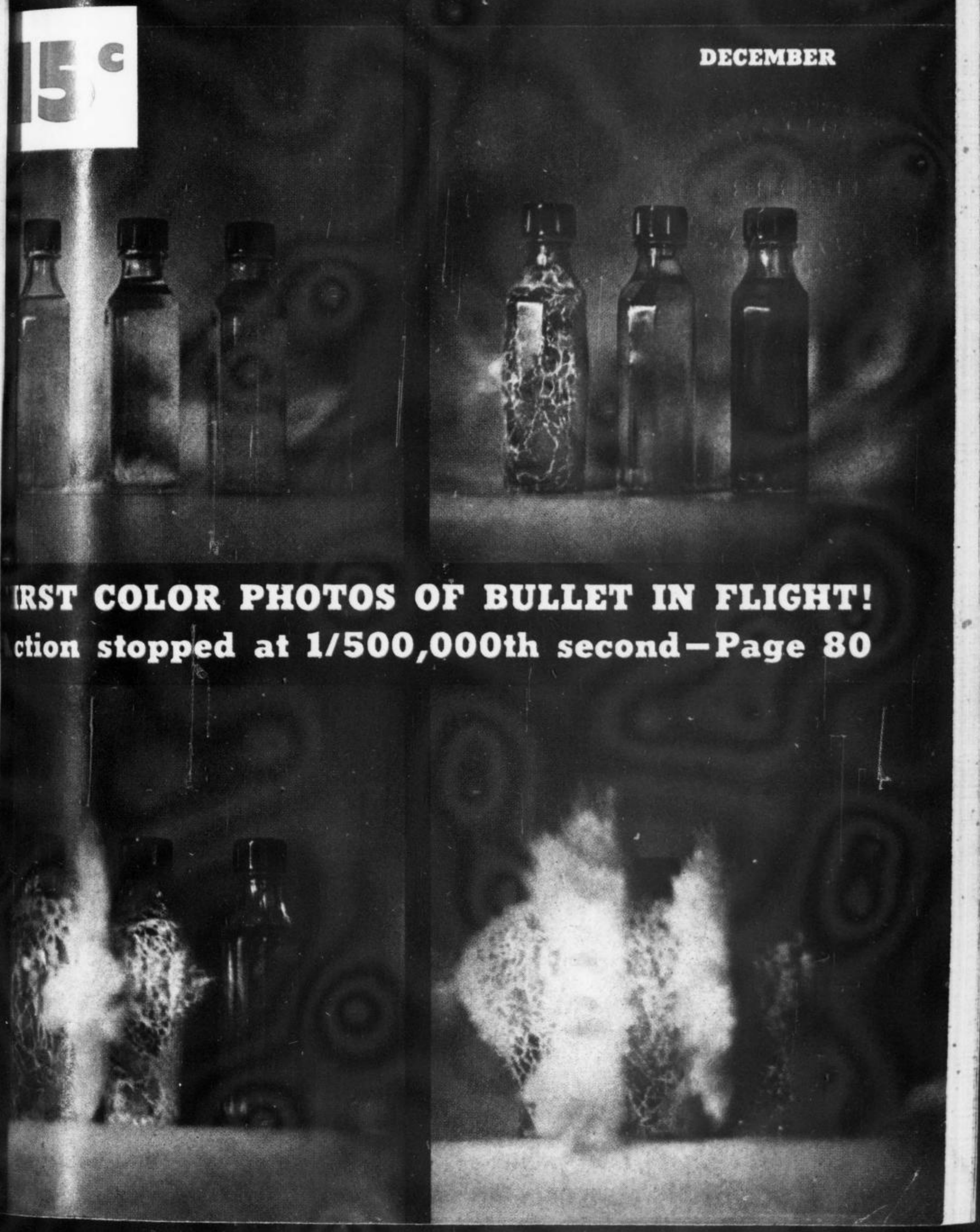

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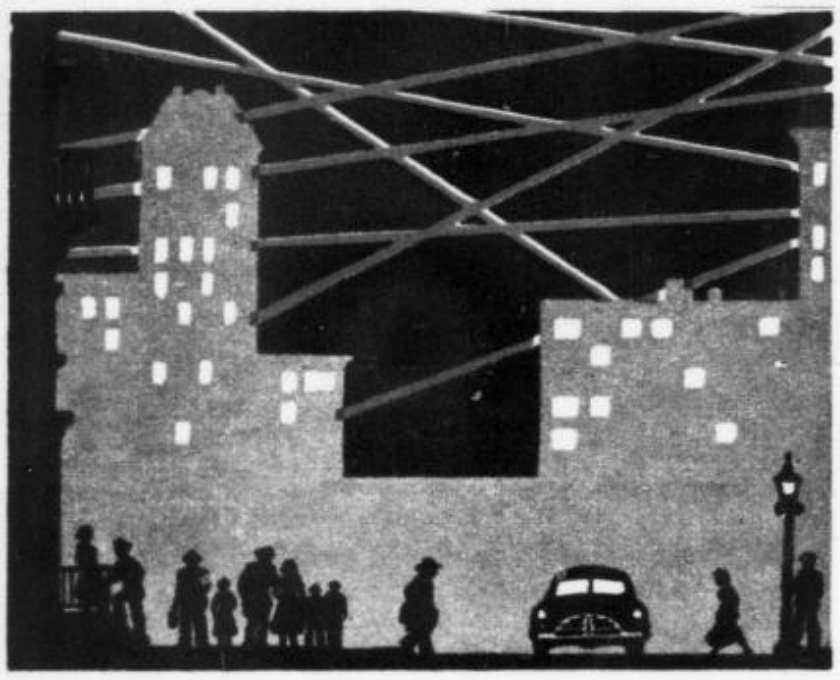
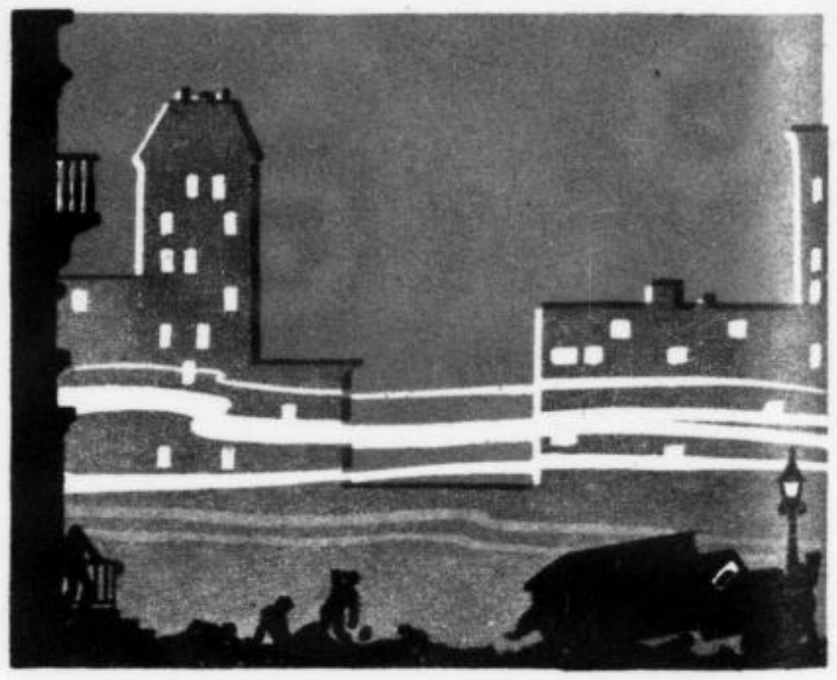
ATOMIC DUSTER

. . . Deadliest Weapon

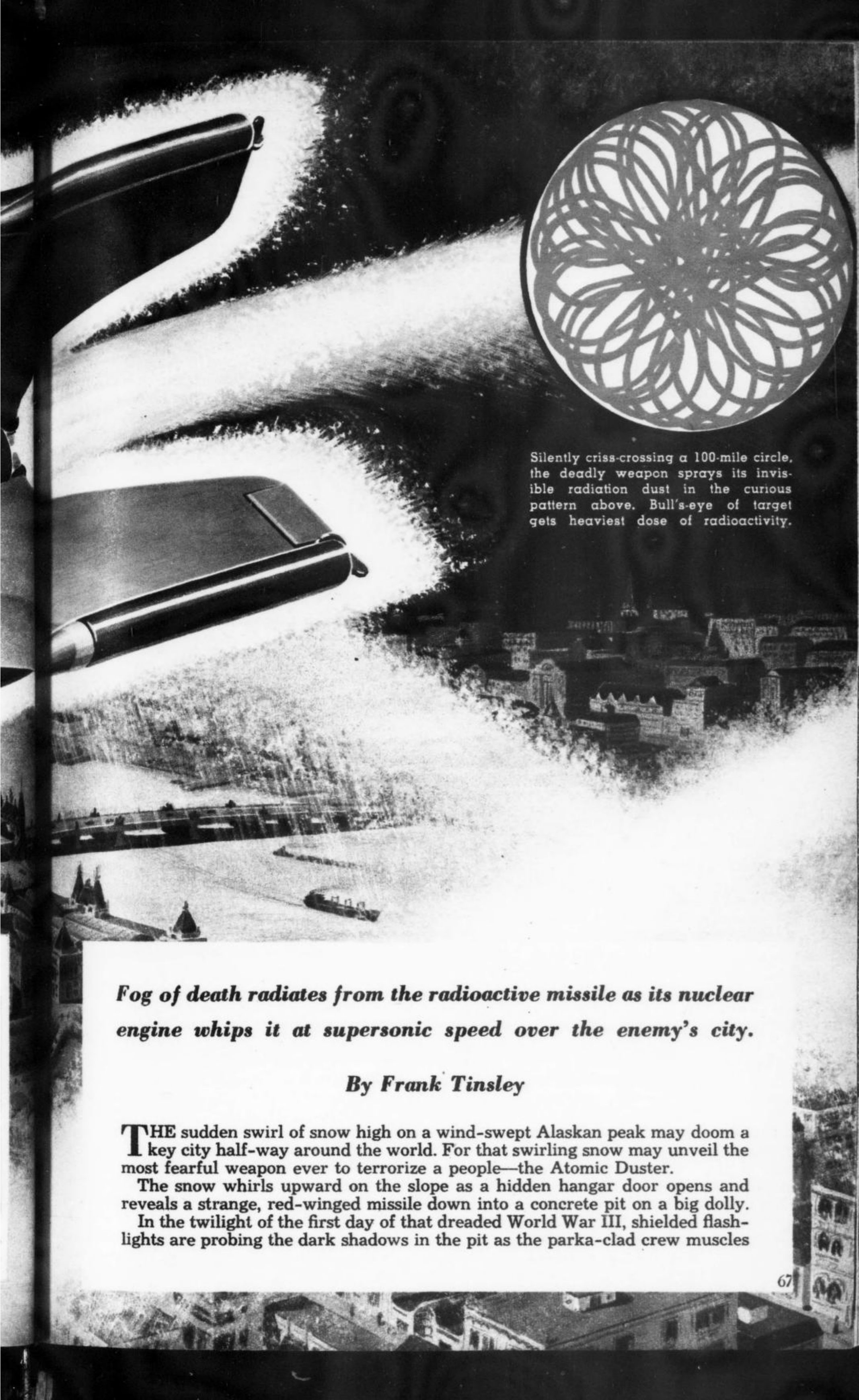


Everything still looks normal that first night while the Atomic Duster circles above the city.



Several days later, people start bleeding to death in the streets—victims of atomic dusting.

FRANK TINSLEY '48



Silently criss-crossing a 100-mile circle, the deadly weapon sprays its invisible radiation dust in the curious pattern above. Bull's-eye of target gets heaviest dose of radioactivity.

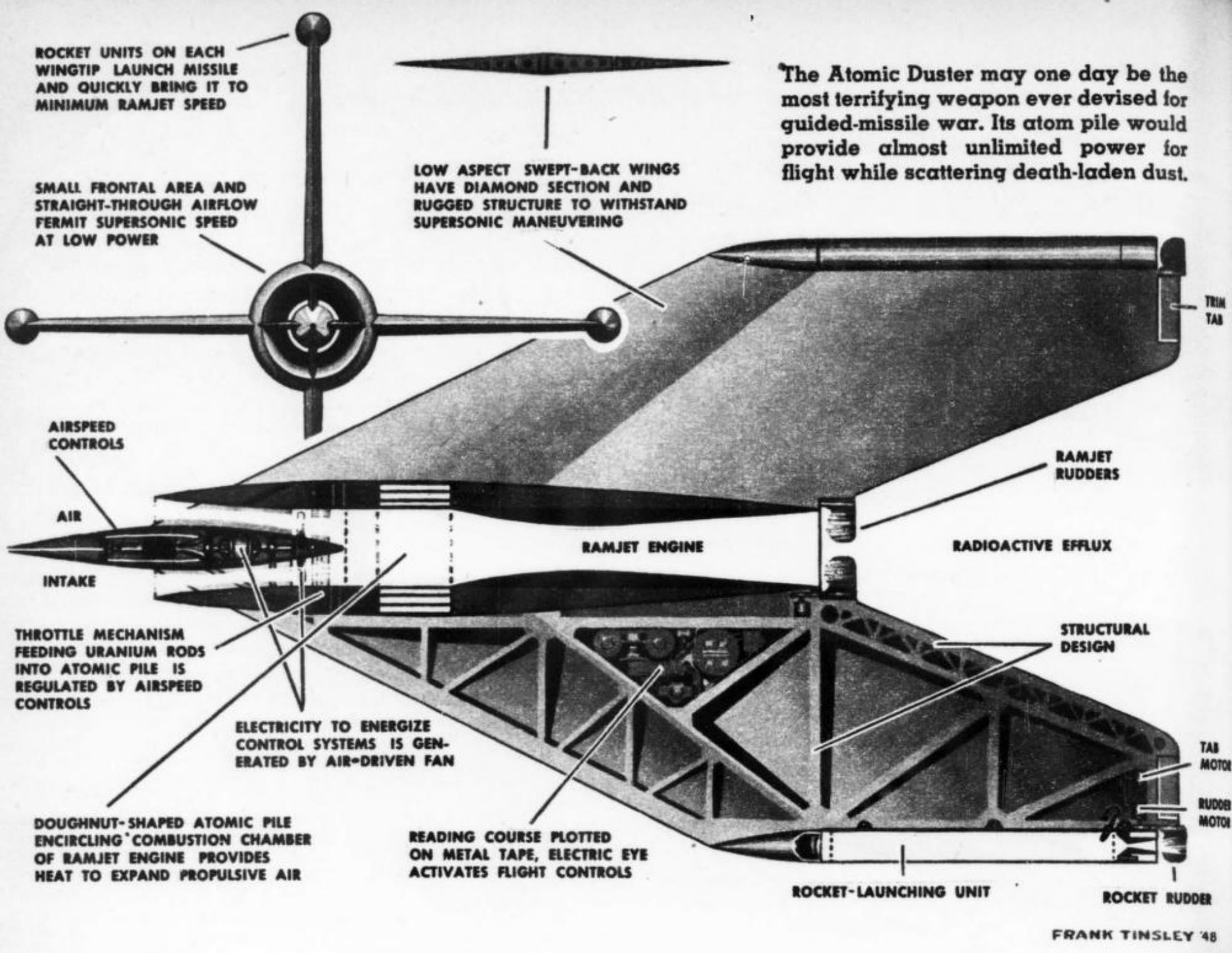
Fog of death radiates from the radioactive missile as its nuclear engine whips it at supersonic speed over the enemy's city.

By Frank Tinsley

THE sudden swirl of snow high on a wind-swept Alaskan peak may doom a key city half-way around the world. For that swirling snow may unveil the most fearful weapon ever to terrorize a people—the Atomic Duster.

The snow whirls upward on the slope as a hidden hangar door opens and reveals a strange, red-winged missile down into a concrete pit on a big dolly.

In the twilight of the first day of that dreaded World War III, shielded flashlights are probing the dark shadows in the pit as the parka-clad crew muscles



The Atomic Duster may one day be the most terrifying weapon ever devised for guided-missile war. Its atom pile would provide almost unlimited power for flight while scattering death-laden dust.

the missile into position on the launching rails. Silhouetted against the afterglow in the west, the set of rails thrusts boldly skyward like a great framework cannon.

Carefully, the crew commander runs his flashlight over the gleaming surfaces of the red missile. At last, he steps behind the shield and takes his post at the firing panel.

"Stand by for launching," he shouts tensely. "Clear the pit!"

The fate of the sheltered city where the enemy has been concentrating his atomic war work rides on those towering rails. But will everything run with the exact split-second precision—the Jato rockets, the atomic-pile feed, the complicated directing mechanisms?

The commander stares at his watch. His hand reaches out toward the firing button and his lips count off the final seconds aloud. His fingertip drops on the button. A searing flash sweeps up and flares blindingly against the snowy peak.

The Atomic Duster roars out of the pit and trails four comet streaks from its Jato launchers as it arcs faster and faster in a long, perfect curve toward its remote target.

Back in the pit, one of the operators at the telemetering dials calls off the airspeeds:

"Five-fifty—six—six-fifty! Enough speed for the ramjet to take over—the pile ought to be switching on now." A sudden shout from the crowd at the observation windows. Abruptly, the fading Jato trails are blotted out by the flaming exhaust from the ramjet engine. The atomic pile is working now, surrounding the combustion chamber with a terrific belt of solar heat.

For several hundred miles, the missile's course is radio-controlled from the launching site. Then, an automatic navigation apparatus guides the Atomic Duster. This navigating robot, whose lenses survey the heavens like the eyes of a human navigator, identifies the proper stars by measuring their light and color intensity. Then, guided by the relation of the stars to each other and to the center of the earth, the robot steers the missile on its predetermined course.

As the Atomic Duster approaches its goal, a homing device supersedes the navigation setup and draws her straight to the target city. Over the center of the target, a fourth mechanism takes control. This zig-zags the missile back and forth across a 100-mile target circle in a series of erratic runs, to foil interceptor jet planes or ground defenses. An electric eye picks up the missile's topsy-turvy course drawn

on a sensitized, steel tape. This eye governs the flight controls which are operated by electric motors.

In the city below, puzzled atomic workers gaze heavenward as the Atomic Duster darts back and forth across the target circle, like a giant needle darning a hole in a sock. Streaking at supersonic speed, the Atomic Duster is invisible in the darkness and much too small and speedy for radar detection. The whiplash roars of her ramjet engine are lost among similar roars of the vainly pursuing jet defenders.

Completely unshielded, the missile's atomic pile is radiating lethal neutrons and gamma rays in all directions, and a concentrated stream of the deadly particles blasts out of the ramjet exhaust. These settle slowly earthward in the same terrible fog of delayed death that struck down thousands of victims at Hiroshima and Nagasaki, days after the bombings!

Hours later, the course control tape unreels toward its end as the Atomic Duster keeps shuttling over the doomed city. The workers in the atom plants are unaware of their mortal danger. Clicking Geiger counters, however, have already confirmed the worst fears of the nuclear scientists—and the high brass. Frantically, they flee.

Finally, the tape's end flickers past the missile's electric eye, and shuts the circuit on a high-explosive destruction charge. A sudden blast in the night signals the end, then bits of the super-radioactive missile shower down on the city.

The atomic-powered ramjet in the Atomic Duster described here is mentioned in the latest progress report on atomic energy power plant development by Andrew Kalitinsky, chief engineer of the hush-hush Nuclear Energy for Propulsion of Aircraft project. The navigational controls are based on these now being developed by Charles A. McPheeters of the Navy's Bureau of Aeronautics.

Purely an anti-personnel weapon, it can wipe out a city's inhabitants without a dollar's worth of property damage. This does away with the backbreaking rebuilding programs necessary after conventional or atomic bombardment. Thus, the Atomic Duster may become not only the deadliest weapon in the world but the ideal club for a strong United Nations to brandish and keep even the most powerful aggressor toeing the peace line. •

Huddled in the dark corners of the dying city, like these Hiroshima victims, terror-stricken people would cringe in vain to escape their doom.

MECHANIX ILLUSTRATED©

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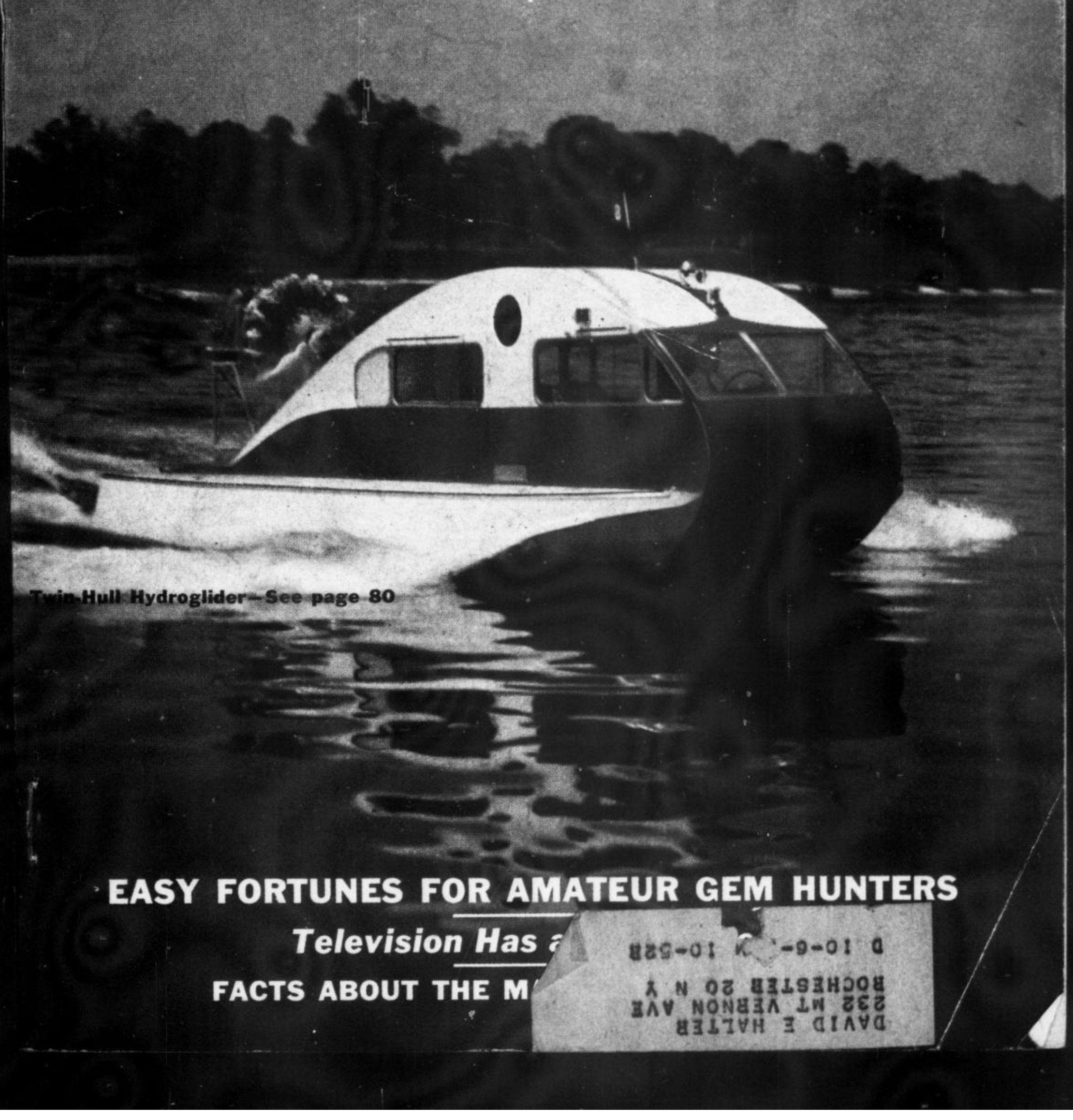
OCTOBER



Twin-Hull Hydroglider—See page 80

EASY FORTUNES FOR AMATEUR GEM HUNTERS

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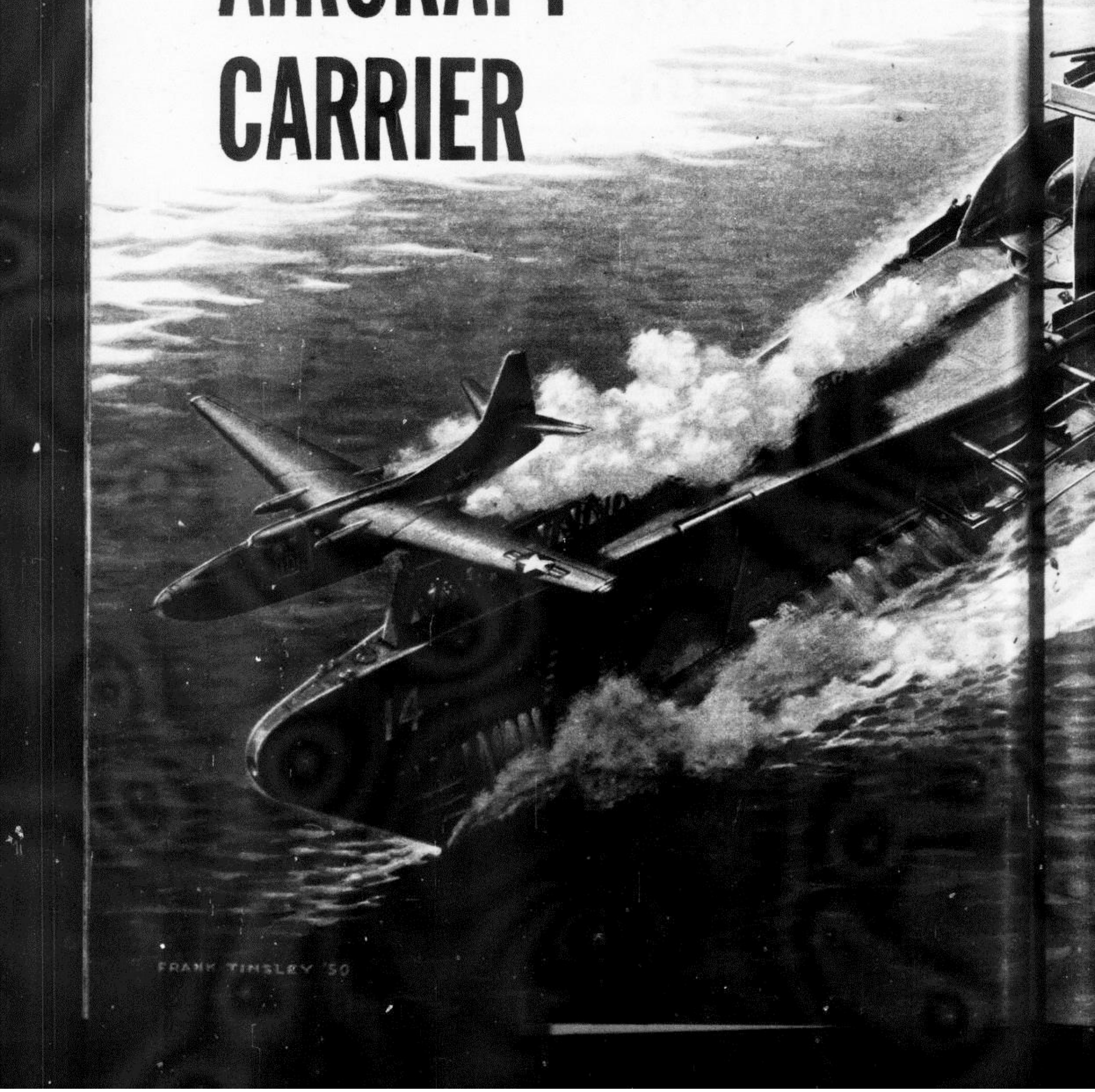
Why Don't We Build a SUBMARINE AIRCRAFT CARRIER



It would be practically invulnerable to atom-bomb attack and could be supported by a vast sub fleet.

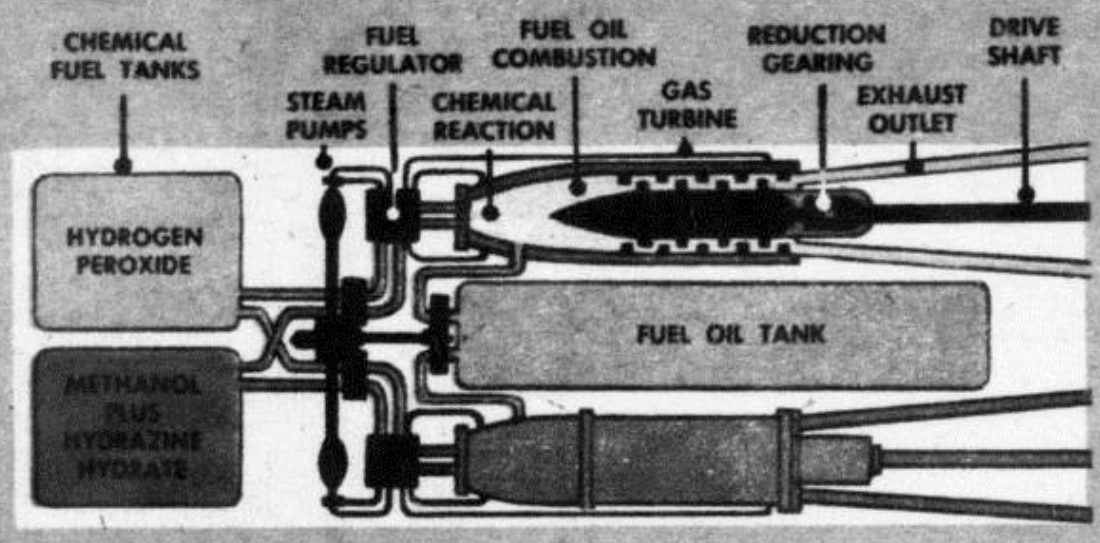
By Frank Tinsley

AIRCRAFT and A-bombs are driving our navy beneath the waves! Already plans for giant submarine aircraft carriers are being discussed in official circles.

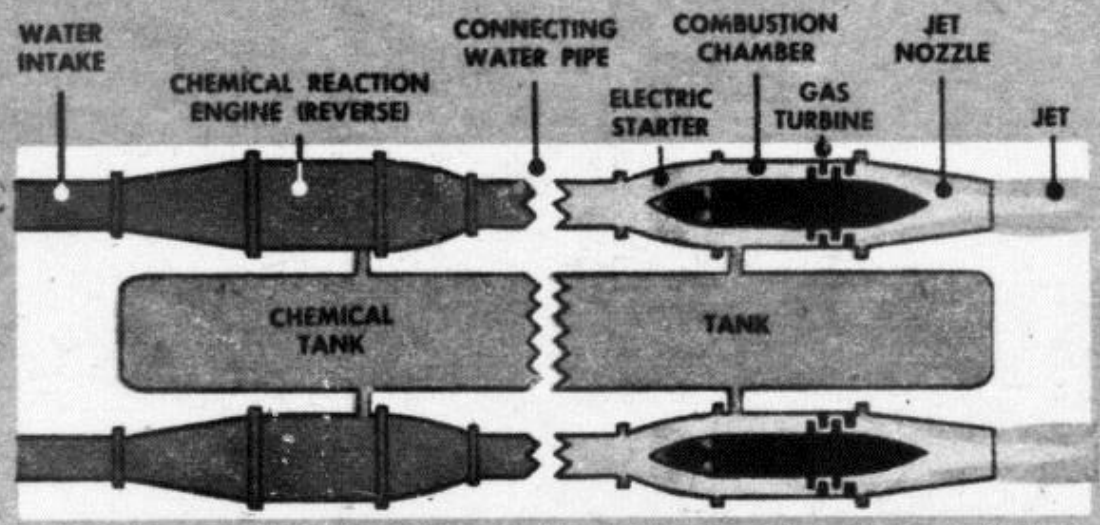
Sad as the thought may be to salty shellbacks of yesteryear, the submarine seems to be taking over sea supremacy. Perhaps the battlewagons with their great guns and shell-defying armor sounded their death rattle when the Prince of Wales, Repulse, and Bismarck were victims of torpedo planes

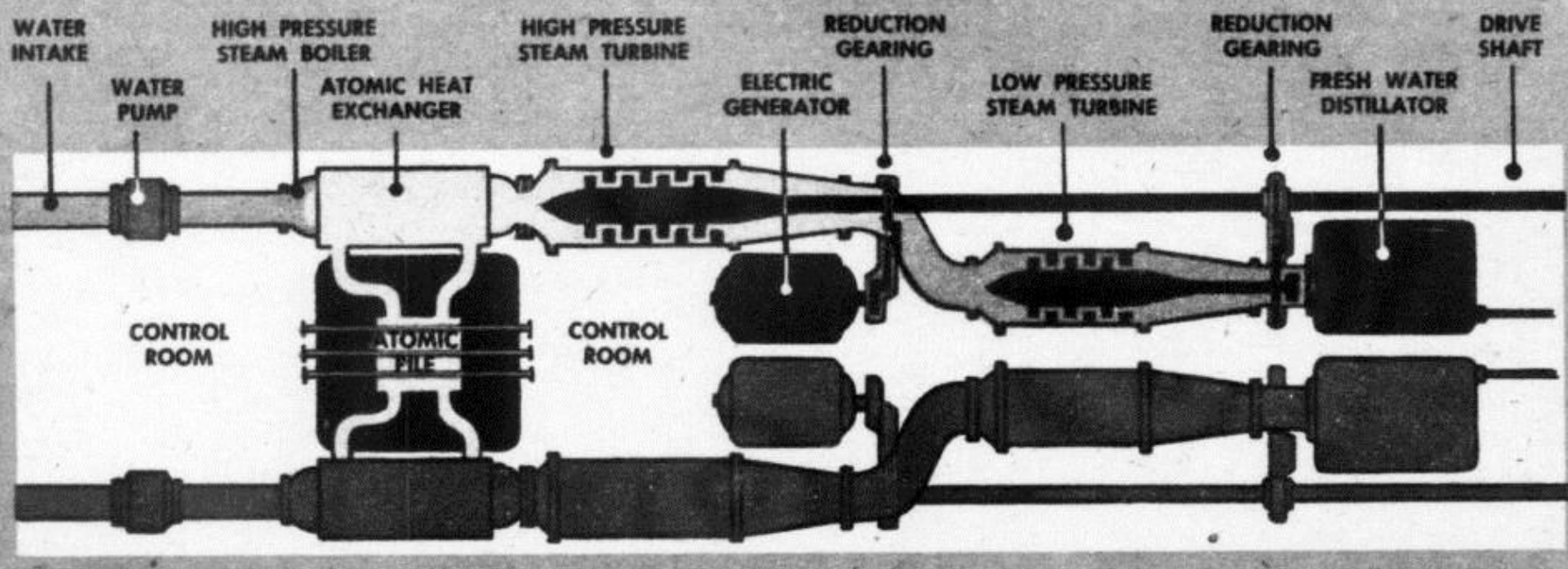
Submarine Power Plants

Walter chemical propulsion system carries its own oxygen for combustion and requires no surface engine air. Hydrogen-peroxide and Methanol are injected into the combustion chamber. The latter is mixed with Hydrazine hydrate which causes a spontaneous reaction. Fuel oil is injected into the hot gases thus created and the resulting blast whirls a high-speed gas turbine. Geared down, this drives the propellers.



Zwicky chemical jet is an underwater form of the aviation ramjet engine. Eliminating the fuel oil, it uses sea water plus a chemical which, when united, spontaneously reacts to produce heat, steam and hydrogen. The combustion chamber is so shaped as to cause this expanding mixture to shoot rearward. Mounted in reverse, twin jets permit maneuvering ahead and astern, one acting as water feed pump while the other is operating.





This is the atomic propulsion plant for the carrier on pages 94-95. Heat from central reactor converts sea water into high-pressure steam which turns turbines. Reduction gearing slows down drive-shaft speed and provides electric power. Exhausted steam is ducted into a second set of low-pressure turbines for additional shaft power. The driveshafts culminate in the conventional type propellers.

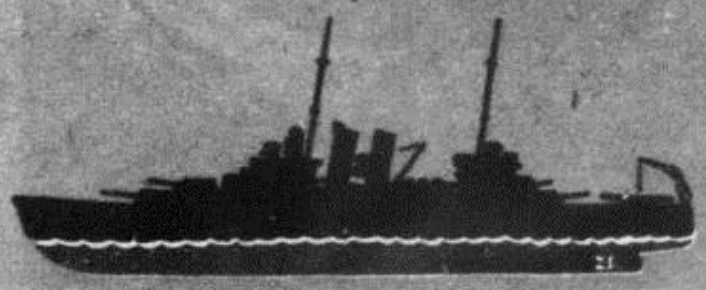
during the last war. They have already given way to the speedy aircraft carrier with its thousand-mile reach and ten-ton punch. But now, even the carrier seems to be doomed and the lowly submarine is emerging as the capital ship of tomorrow.

The tipoff on the submarine's new status is the gradual growth of highly specialized undersea types. These parallel closely the development of the surface navy with its wide variety of models and classes, from the giant super-dreadnaught to the tiny PT boat. Now there are subs that range from the miniature, two-man midget to the 4663-ton Japanese 1-400 class monsters that carried three four-ton bombing planes and had a cruising range of 34,000 miles!

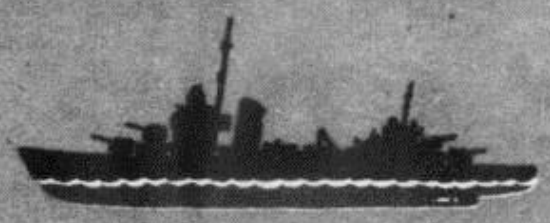
The 1-400s were really underwater aircraft carriers, built to bomb the Panama Canal and American coastal cities. They were capable of nearly 20 knots on the surface but had a low submerged speed of seven knots. Their planes, launched from a catapult on the foredeck, could carry a bomb load of 1600 pounds each but were not recoverable.

Rumors have now begun to circulate about the possibility of building an American submarine aircraft carrier. The illustration on pages 94-95 shows just what that super-sub may look like. It's a big ship —about the size of our heavy surface cruisers. The real Sunday punch would be atom bombs, carried in the bomb bays of propjet

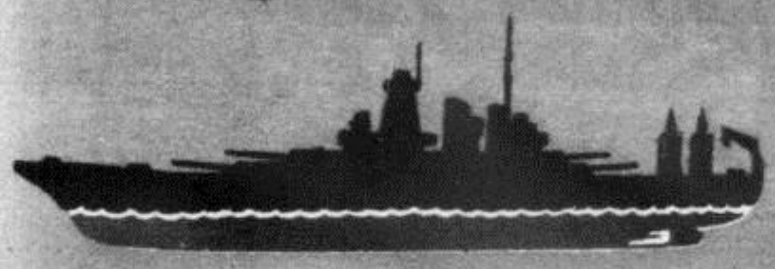
Surface Navy vs. Submarine Navy



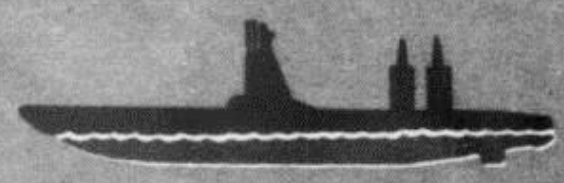
Heavy cruiser, left, may be matched by giant sub carrier, right, carrying planes, missiles and eight-inch guns.

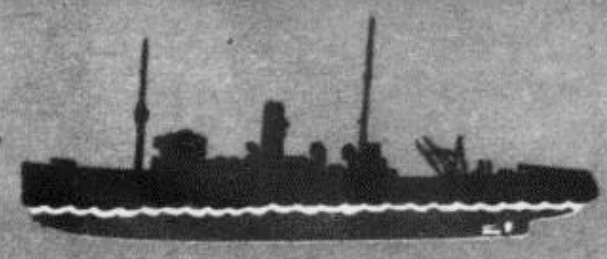


Destroyer, left, corresponds to killer-type sub, right—a speedy and highly maneuverable underseas terror.

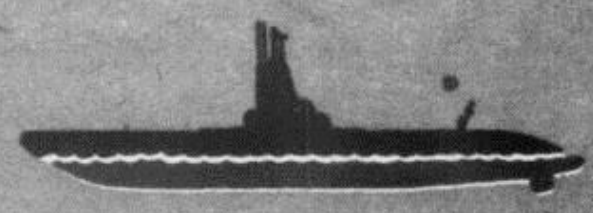


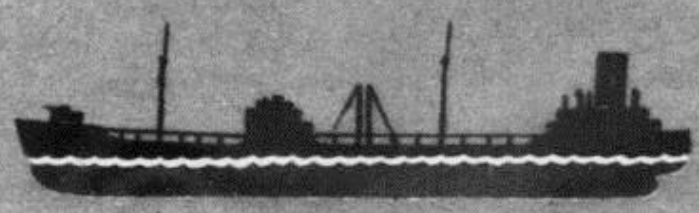
Like its converted battleship counterpart, left, the sub missile-launcher, right, directs bombs toward far-off targets.



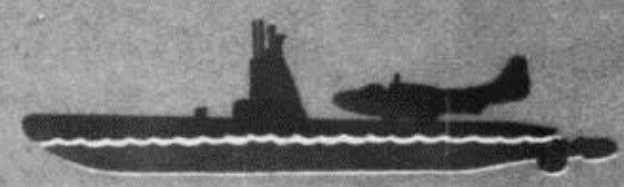


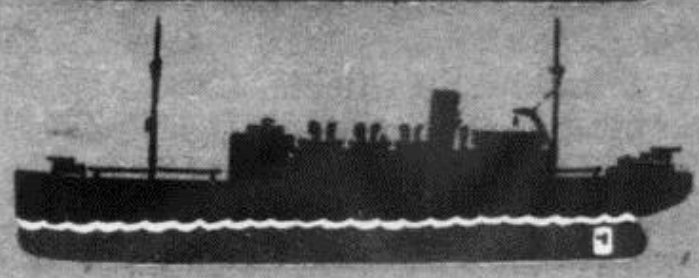
Minelayer, left, could be replaced by specialized submarine, right, which served us so well during the last world war.



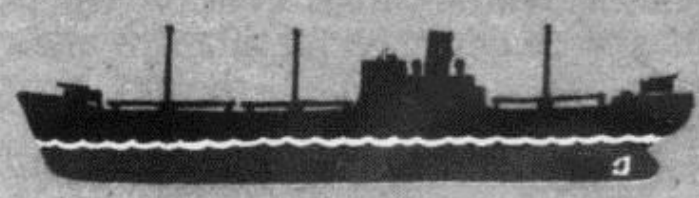


Even the tanker, left, can go beneath the surface, right. Empty, it could double as a surface aircraft spotter.





Troop transport, left, can be supplemented by sub troop carrier, right, which ferries special landing forces.

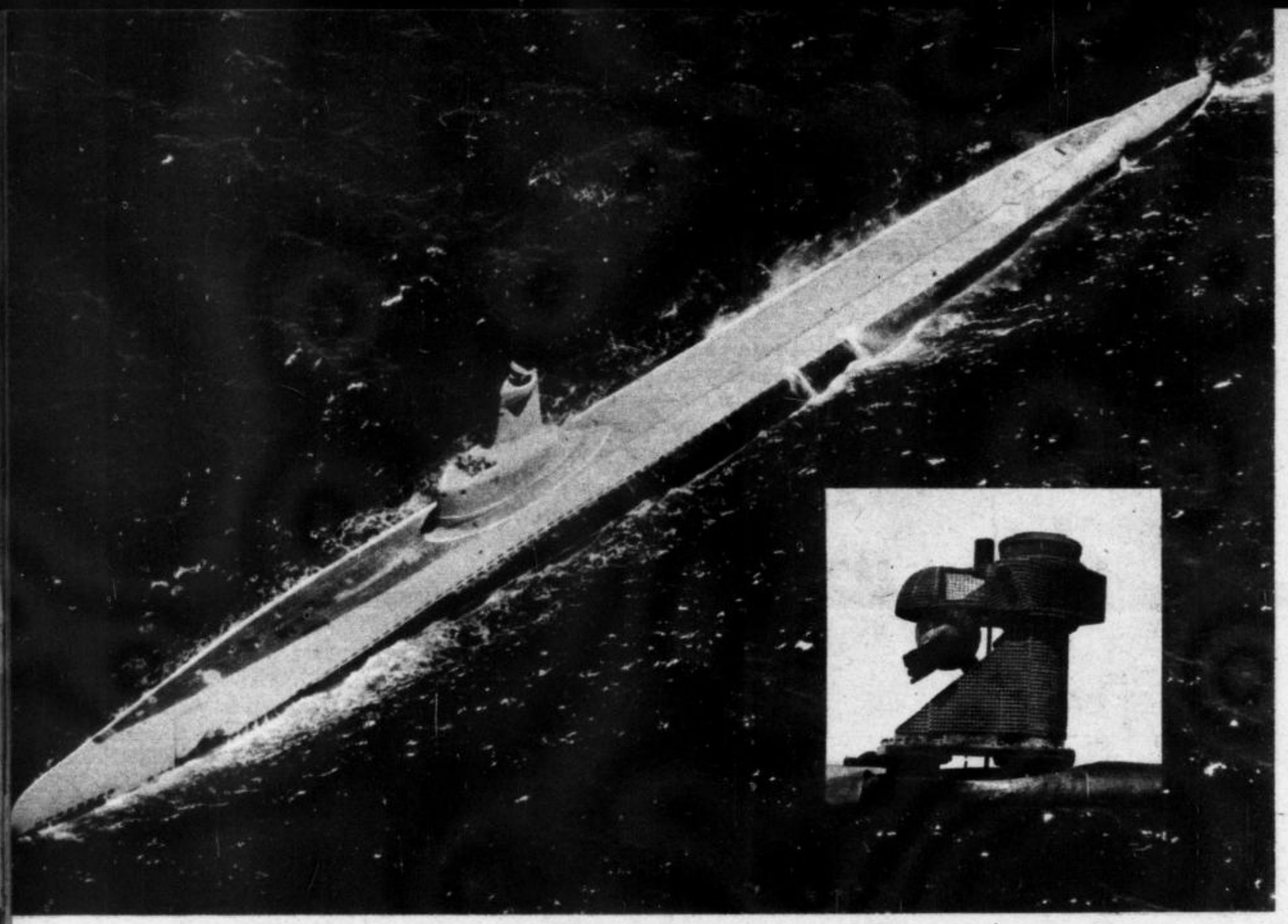


Freighter, left, may be limited to cheap cargoes while sub freighter, right, carries scarce and valuable equipment.

flying boats. These could be rocket-launched from a retractable catapult on the forward deck and retrieved over a stern ramp after making conventional water landings.

This sub can pack a secondary long-range punch in the form of 20, V-2 size, controlled missiles carried in horizontal tubes on either side of the hangar. Above them are gun galleries mounting 40 high-velocity three-inch guns for close fighting. Twin eight-inchers in streamlined turrets, fore and aft, help out at intermediate ranges and 12 twin-rocket launchers in retractable turrets on the upper deck take care of long-range defense. Batteries of bow and stern torpedo tubes, plus a few broadside installations amidship, cover the ship's underwater approaches.

This atomic super-sub could carry all the usual undersea equipment. Like its big surface sisters, it would bulge with large anti-torpedo blisters which also function as diving tanks and liquid storage space. The pressure hull, in figure-eight form and extending into the superstructure, has a number of decks for stores, galleys, public rooms and crew accommodations. The upper level of the superstructure, containing the gun turrets and rocket launchers, is unpressurized except for the central section beneath the bridge. The latter includes a surface-combat command post, a closed bridge above and a flying bridge above



German-developed Snorkel, inset, such as we have adapted to our large subs, one of which is shown here, enable these ships to inhale and exhale while remaining submerged for long periods of time.

that. The last is fitted with wings that fold back flush with the structure when submerged. A pair of radar masts also fold flush in the upper deck, as do the bulwarks. A full complement of tenders, including two crash boats for plane launching duty, are stowed in compartments beneath the forward and after decks. They are launched from retractable, boom-type davits. Standard escape hatches are also provided.

This sub-surface raider would not be much bigger than the Jap 1-400 aircraft carrier. It would be just a little more than half again as large as our own World War II submarines. The latter are now in a size class with destroyers and it would not be too long a stretch to step up new models to cruiser proportions.

But why stop at undersea aircraft carriers? Why not a full sub fleet? There can be little question as to the tactical need. As the fighting navy is driven from the surface, the necessity for submersible aircraft carriers, landing ships and coastal-bombardment craft will become apparent. Then, sub-surface tankers, tenders and ammunition ships will be needed to service them. And troop carriers and cargo subs will have to be built to maintain our lines of communication and outposts. Aircraft tenders and rescue subs will also be required to refuel and protect the underwater aircraft. In short, complete sub fleets. Contrary to popular opinion, American submarines of World War II were not the best. Generally speaking, they were superior to the Japs' but considerably behind the German U-boats in concept and design. Depending upon quantity rather than quality, Uncle Sam's subs were designed for efficient mass production. As it happened, the strategy paid off and we won in the Pacific. Had the European war lasted a little longer, however, the German Snorkel U-boat, combined with advanced aircraft and missile design, might have turned the scales.

As long as we're preparing for an atomic war, we should use atomic power plants in our subs. The bottom diagram on page 96 illustrates an atomic power layout for a large, super-submarine. A setup such as this turns the pigboat of yesterday into a real naval weapon. Requiring no vast fuel tanks and battery compartments, it can cruise indefinitely, creating its own heat, power, fresh water and conditioned atmosphere as it goes. With its compact power plant set deep in the hull, there is ample elbow room for the crew.

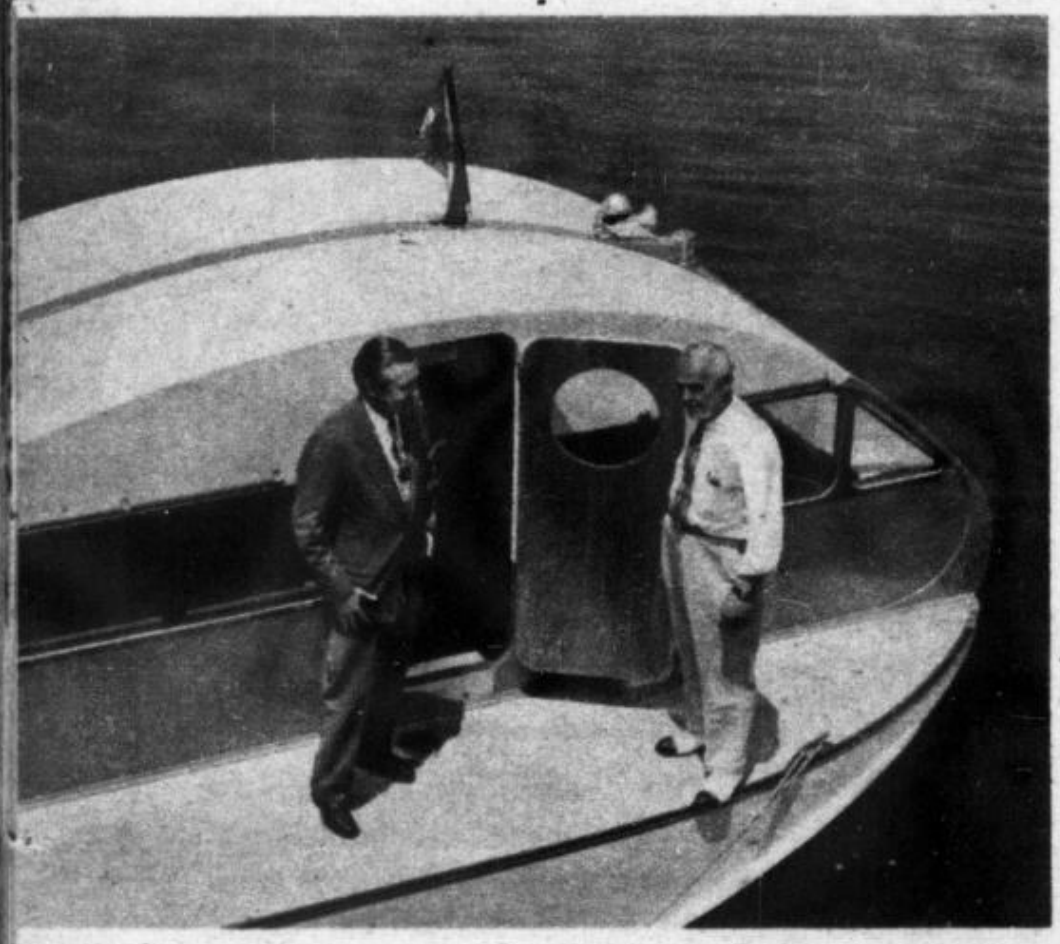
In World War II, America achieved the greatest surface navy in all history. Let's hope that the near future will find us equally proud of our sub-surface fighters—the world's first complete undersea navy. •

COVER STORY

At speed, the craft's reversely symmetrical and unequally stepped floats enable her to plane over the surface. At rest she draws six inches.

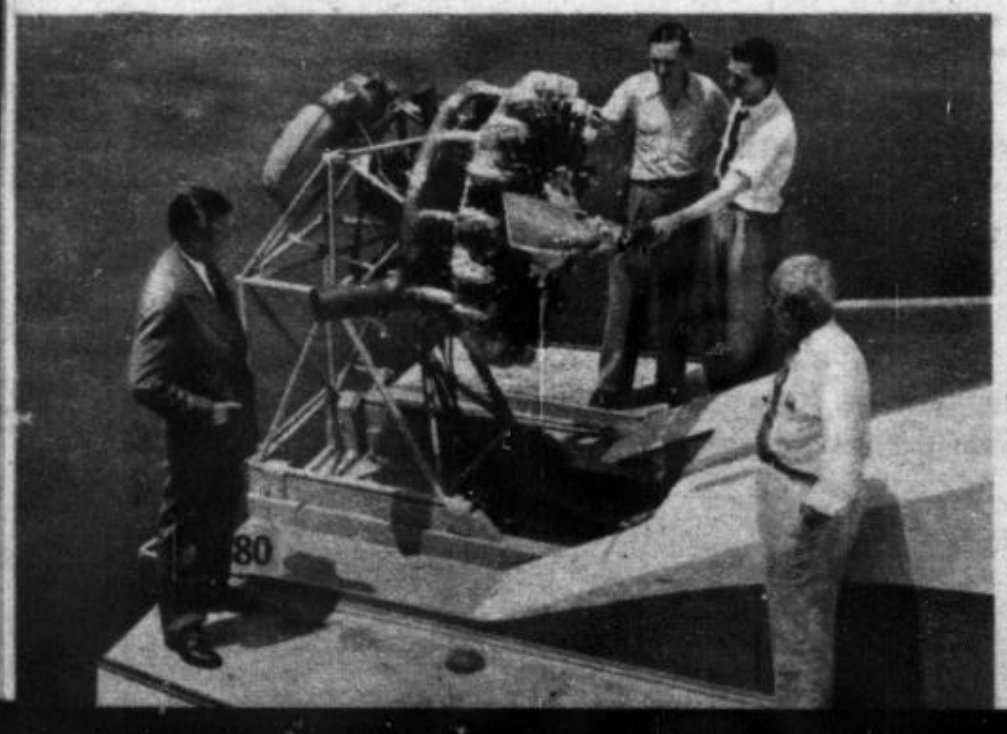
Twin-Hull Hydroglider

SPEEDS in excess of 60 miles an hour have already been attained by the airscrew-driven cabin cruiser pictured on the cover of this month's MECHANIX ILLUSTRATED—and her inventor is confident that the Suncraft is capable of doing better than 70. Built over two wooden pontoons, each with its own keel and rudder, the 28-foot craft combines aerodynamic and hydrodynamic features which reflect the aviation and marine experience of her designer, Capt. Hugo Sundstedt, who won his rank in the Swedish Navy as a ship's officer and who flew during World War I with the famed Lafayette Escadrille. He has been perfecting the boat since 1925, feels it is now ready for production. Price: $12,000. •



The hydroglider's designer, Capt. Hugo Sundstedt, shown at right discussing his craft with MI's Editor Bill Parker, was one of the first air pilots.

MI Boating Editor Jock Kingdon, second from right, below, points to the stub-tipped aircraft propeller. Ring around prop was later installed to cut noise.



Rear view of the Suncraft shows how the twin hulls give the odd vessel an almost raft-like stability.

"I PILOTED A ROCKET SHIP AT 1,400 MILES AN HOUR!"

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2nd ... FLOOR

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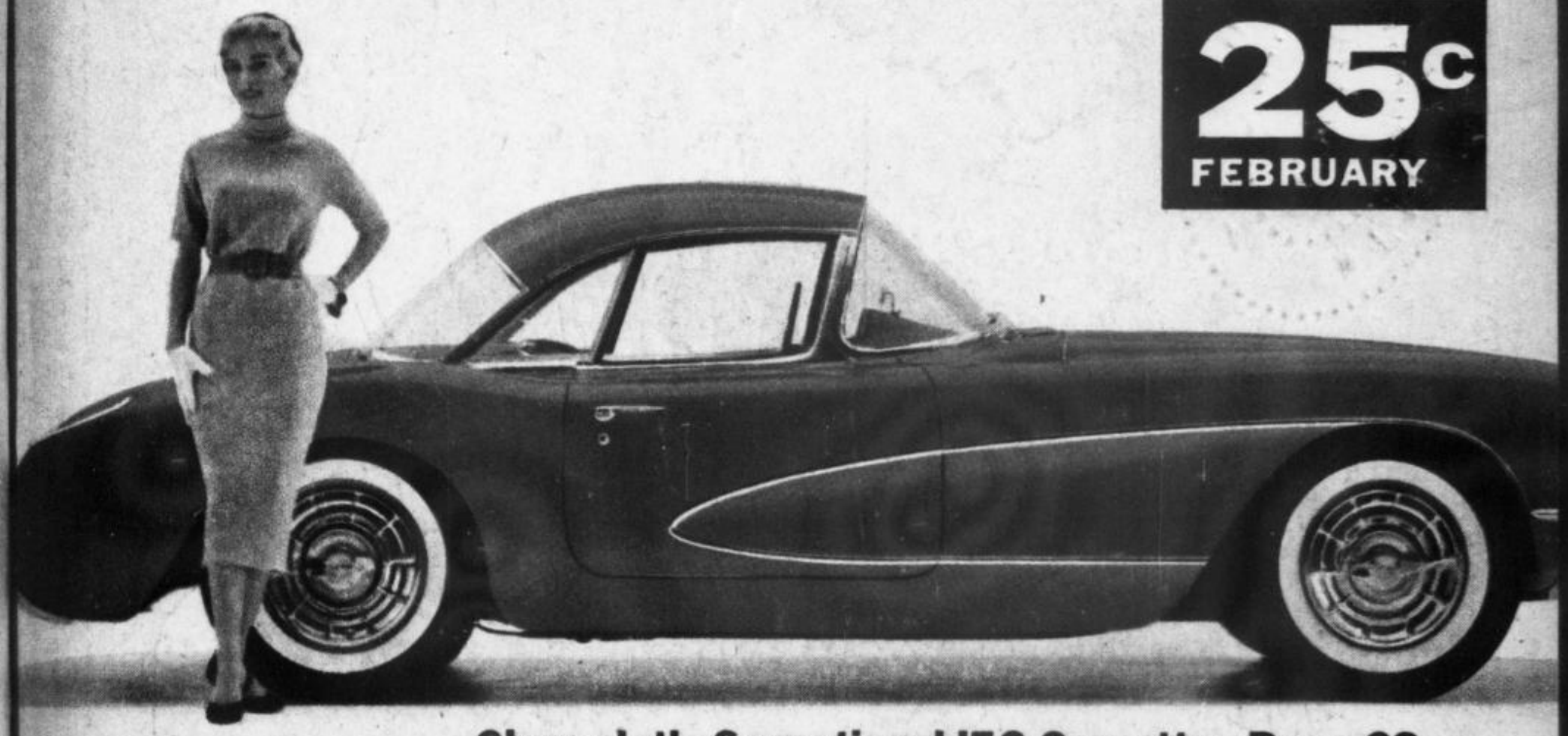

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EXCLUSIVE! HOW TO SOLVE OUR BIG-CITY TRAFFIC JAMS

Mechanix Illustrated

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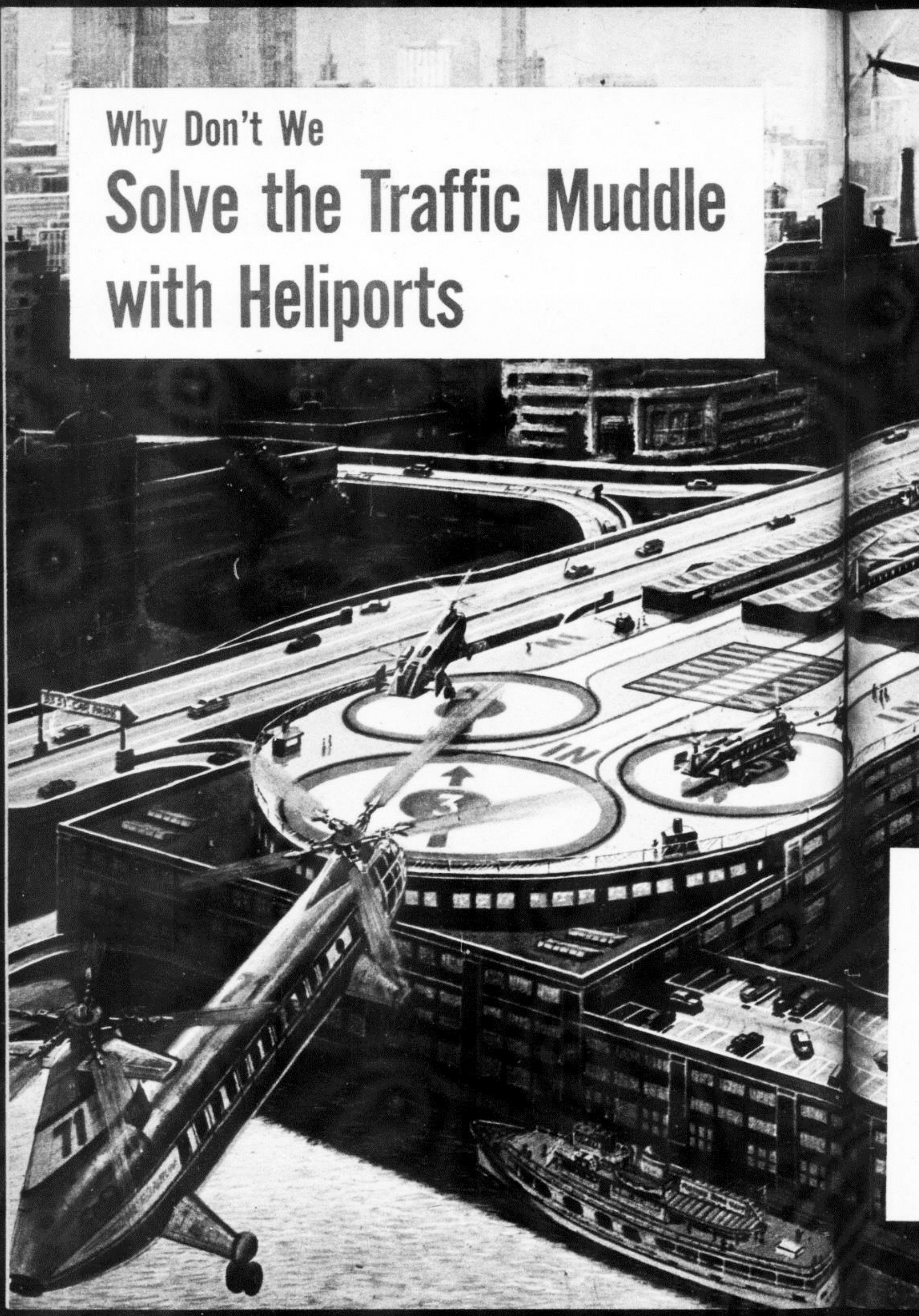
Why Don't We

Solve the Traffic Muddle with Heliports

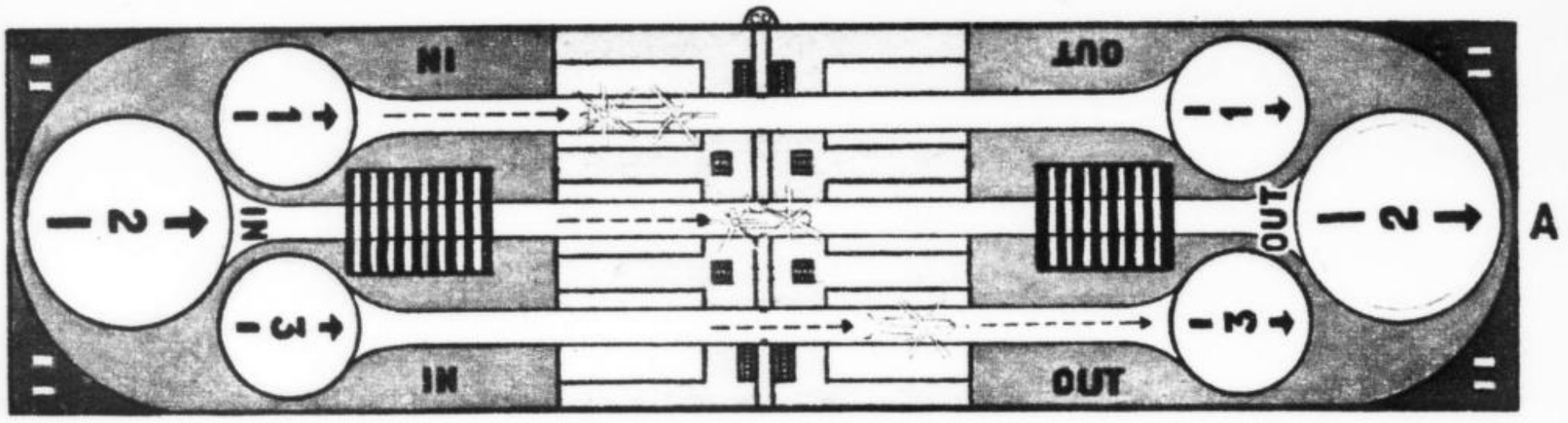


Commuting jams, traffic snarls and parking shortages are solved by MI's novel shorefront traffic center.

By Frank Tinsley

RAUCOUS horns and squealing brakes, short tempers and shorter lives—this is the price American cities are paying for traffic jams which threaten to strangle commerce, bring all transportation to a standstill and clamp a death-hold on urban living.

Today there are 44,000,000 passenger cars on the road. By 1966 it is estimated that there will be at least 65,000,000. Meanwhile, road construction lags, streets remain as narrow as ever and the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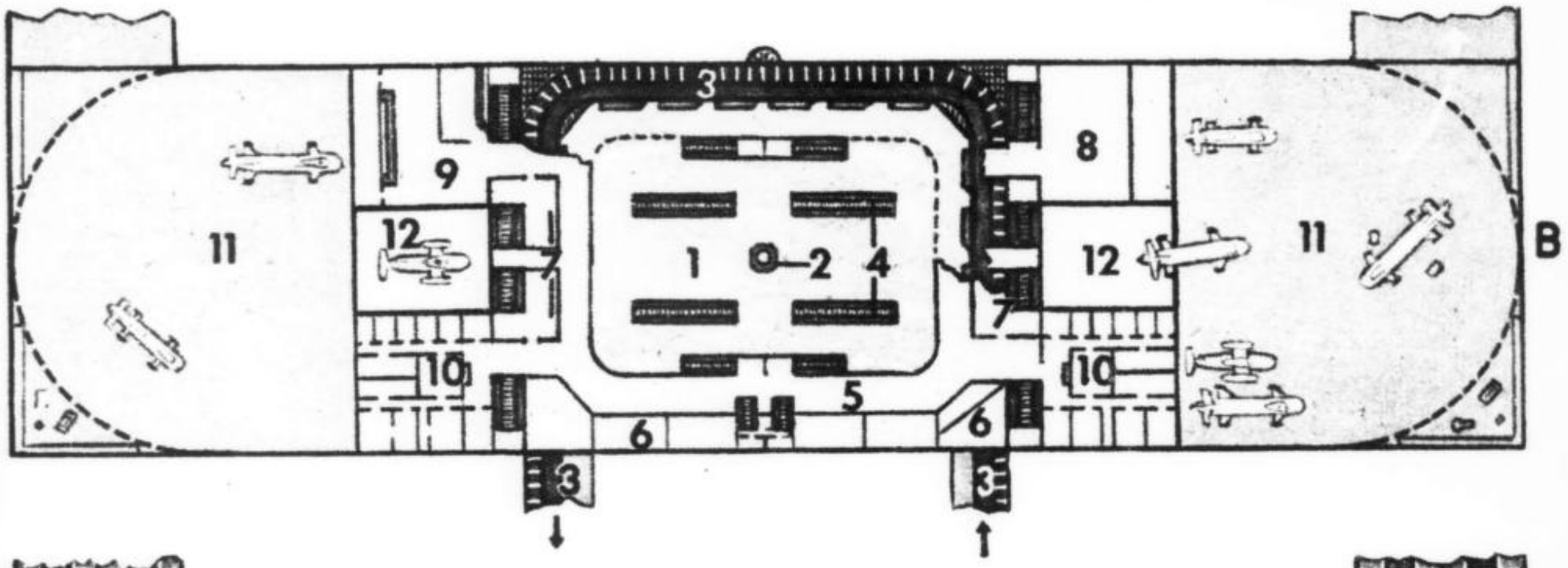

B

C
D

Left: MI's four-level super terminal showing the planned through-flow traffic systems.

A. Top level (flight deck) features "dumbbell plan" of pass-through copter handling directed by control tower. Incoming copters let down on one of three landing pods at end of deck. Pod floors are circular turntables floating in shallow water tanks which distribute landing shock. Pods rotate to point arrows in current upwind landing direction. After landing, pod floor turns again to head copter up its runway. Copter is then towed to unloading platform, refueling station, loading platform and to take-off pod at the other end of flight deck.

B. Third floor is in three sections. At each end is hangar for emergency repairs and storage connected with flight deck above by copter elevator. Central part is main passenger lobby around which runs terminal loop of crosstown expressway and moving sidewalk. From this passengers go in direct flow to escalators leading to loading platforms above. Key: 1. main lobby; 2. information booth; 3. moving sidewalk; 4. escalator/stairs; 5. balcony; 6. ticket office; 7. rest rooms; 8. restaurant; 9. coffee room/bar; 10. business offices; 11. hangar areas; 12. copter elevators to flight deck.

C. Second floor terminal vehicular level contains central taxicab and car entry with escalators leading up to commuter lobby. On water side are four ferry-slip gates (1), connecting with upper car decks of ferries. On street side is entrance (2) and exit (3) of elevated crosstown expressway. Rush hour taxis drive on outer half (4) of moving belt, unloading while going around loop. Passengers descend on inner half of belt (5) and pass to platform (6). Taxi stand at rear (7) feeds cabs into empty spaces on belt. 8. diagonal parking space; 9. automatic parking racks on piers; 10. drive-off turntables; 11. passenger walkways, platforms lead to all conventionally parked cars and automatic check-in points; all lead to escalator/stairs to upper levels (12). 13. copter level pits; 14. pier roofs used for the copters or additional automobile parking space.

D. Ground floor's twin bus depots occupy each end of terminal and connect with the street and lower bus decks of ferries. Key: 1. street entrances; 2. main bus lobbies; 3. waiting rooms for dock sections; 4. connecting passage and escalators; 5. turntables; 6. parking belts; 7. 80 loading and unloading docks; 8. passenger walkways, platforms; 9. ferry slips; 10. access passages.

parking space for the family car has become as extinct as the cigar store Indian.

Parking meters, off-street garages and rigidly enforced parking laws are no better than half-hearted stop-gap measures. Our traffic and parking muddles grow worse daily and unless a fresh and revolutionary approach is taken to the problems of urban traffic, authorities have predicted the gradual decay and decline of the big cities that today are the nation's pride.

One answer to the problem of transporting growing populations in and out of cities without adding to the traffic congestion is, obviously, helicopters.

By 1975—according to New York's famed Port Authority—intercity, commuter and aerocab helicopters will be carrying an estimated 6,000,000 passengers, 6,500,000 pounds of cargo and 40,500,000 pounds of mail in and out of New York every year!

The problems involved in handling this vast potential traffic do not include the actual flying equipment. Copter design has come along so fast that prototypes now flying can carry 20 to 50 passengers in airline comfort and twin-engine safety. Powerful gas turbines are being tested, instruments perfected for night flying and traffic control systems worked out.

Only one phase of the helicopter transport problem has been neglected: copter designers and operators have pushed the question of mass passenger handling into the background. Our city and airline planners are still talking in archaic terms of wide landing areas with copters taxiing to and fro, landing their hapless passengers on rain and windswept open decks. Their thinking is still fettered to today's airport procedures.

One solution to the helicopter passenger handling problem was proposed several years ago by James B. Edwards, then Chief Engineer of Hiller Helicopters, now engaged in developing large passenger copters for Douglas Aircraft. Edwards suggested a "dumbbell" form of heliport with separate landing and take-off circles linked by a narrow neck containing the unloading, refueling, checking and loading facilities.

An elaboration of Edwards' remark-

able plan, plus recent aircraft landing developments and ultramodern forms of surface transportation, is the basis of MI's super traffic center shown here.

In line with the latest safety practice, it takes the form of a waterside unit catering to overwater helicopter routes. These have been found much more desirable than flights over densely populated land areas. Waterways make clearer visual guides for contact flying, permit flatter landing approaches, reduce noise nuisance and with the emergency flotation gear now in use provide continuous, relatively unencumbered strips for unexpected set-downs.

Crowded Manhattan with its close-packed office buildings, narrow streets and daily tides of out-of-town workers is a perfect case in point. The basic plan, however, can serve equally well on Chicago's lakefront, San Francisco's bay shores or the riversides of New Orleans, St. Louis, etc.

Basically, MI's super traffic center is a four-level structure built parallel to the shorefront with a 600-ft. pier extending out into the river from each end. Between these protecting dikes is a row of ferry slips accommodating four boats at a time. These high-speed, triple-decked ferries are designed to carry interurban buses on their lower level and private cars above. They permit the commuter to travel from his curb to city terminal without leaving his seat.

On the land side of the building a series of curved roads and inclined ramps connect the interior at various levels with river drives, boulevards, cross-town expressways and vehicular tubes and bridges.

On the street level, twin bus depots occupy the ends of the ground floor. As shown, there is space for 80 loading docks accommodating buses up to 40 ft. in length.

Driving on to a turntable, the bus is swung sideways. In this position, it is carried by conveyor to its allotted dock and there driven off. Passengers descend to finger platforms between the docks and proceed by walkway to waiting rooms and the street—or by escalator to the taxi level or crosstown expressway. Buses departing from the terminal would reverse the procedure.

In the center of the building is the main bus passenger lobby containing ticket offices, rest rooms, shops, etc. All are equipped with both stairs and escalators for maximum rush-hour flow.

Flanking the bus lobby are broad driveways that lead from the street directly to the ferry slips. At the extreme ends of the building, other driveways and sidewalks permit independent passage to the lower level of the projecting piers.

The second floor of MI's terminal, 20 feet above the street, is the car and taxicab level, with access links to the elevated riverfront drive and crosstown expressway. These links enter the building at one side of its center section, follow a semi-circular path within and exit at the other side.

A moving belt system would expedite the orderly flow of traffic. The proposed belt works on a simple principle. A white line divides it into two longitudinal lanes, the outer one subdivided into car lengths by transverse lines. This is the vehicular lane. The inner lane is a moving sidewalk for passengers. Arriving cabs drive onto the outer lane and park in the nearest unoccupied space. They are then carried around the loop at a walking pace (3 mph) emptying the next space for succeeding cars.

The passengers alight on the inner lane. As both lanes travel together, cab and passenger maintain the same relative positions that they would on a static driveway. The passenger then walks to the inner side of the lane and steps on one of the short exit belts moving at the same rate of speed. He steps off this, straight ahead as one steps off an escalator, to the fixed central platform inside the loop. From this, escalators lead aloft to the airline passenger concourse and platforms. Others lead below to the bus depot.

In operation, the automatic parking device resembles that of the bus system. Driving off the ferry, the incoming commuter is directed toward one of the parking lanes. As the mechanism swings his car broadside to the conveyor, a bell rings and a claim ticket pops out of the slot machine at the gate. This is a plastic

punch card that records the date and dock in which the car is to be deposited. The patron then heads for the cab platform on the expressway. Returning in the evening, he inserts his claim check in another slot and his car is automatically delivered at the same turntable.

Above the parking floors are helicopter hangars and the lobby for air passengers. The latter is a large open concourse on two levels. Its main floor, with an information booth in the center, is surrounded by a U-shaped moving sidewalk that enters along one side, turns to cross the rear wall and then again to exit on the other side. Unlike the taxicab belt which is merely a short unloading loop, this sidewalk runs the full length of the crosstown expressway, traveling in an enclosed deck above vehicular level. At the other side of town, it makes another U-turn in the twin terminal and starts back.

On a wide balcony running completely around the concourse perimeter, above the expressway belt, are ticket offices, shops, rest rooms, etc. Opening off one end is a riverview restaurant, storerooms, and garment checking facilities. In this area, the front of the building is occupied by business offices of the airlines. Beyond, at the ends, are hangars with 40 foot ceiling clearance, capable of accommodating the largest projected helicopters for emergency repairs or check-ups. These connect with the flight deck by means of large, aircraft type elevators.

From here, well below the operations level, reserve copters can be fed up to their flight deck loading positions with minimum loss of time.

As mentioned before, MI's flight deck features the Edwards plan with "dumbbell" runways. Three of these are nested together so that each is served by passenger platforms on either side of its pass-through track.

Landing pads on each end of the deck are designed to take copters of various sizes. The smaller pairs are 100 feet in diameter, the larger ones 150.

The pads float in two inches of water contained in a shallow tank designed to distribute the landing shock.

Incoming copters are directed to the pad designated by the control tower. Upon landing, the pad is rotated like a turntable until the copter is headed up the runway. It is then towed to the unloading platform, refueling station, loading platform and to the take-off pod at the other end.

The rush hour of the future will see a smooth, orderly flow of New York commuters from hundreds of suburban towns scattered through a circle 200 miles in diameter. It is this potential air and surface traffic that we must provide for. The plan herein proposed is just a springboard. Why don't we start *now* to design tomorrow's super traffic centers for our greatest cities. •

Artist's drawing of New York City's proposed $5,000,000 West 30th Street heliport.

COVER STORY

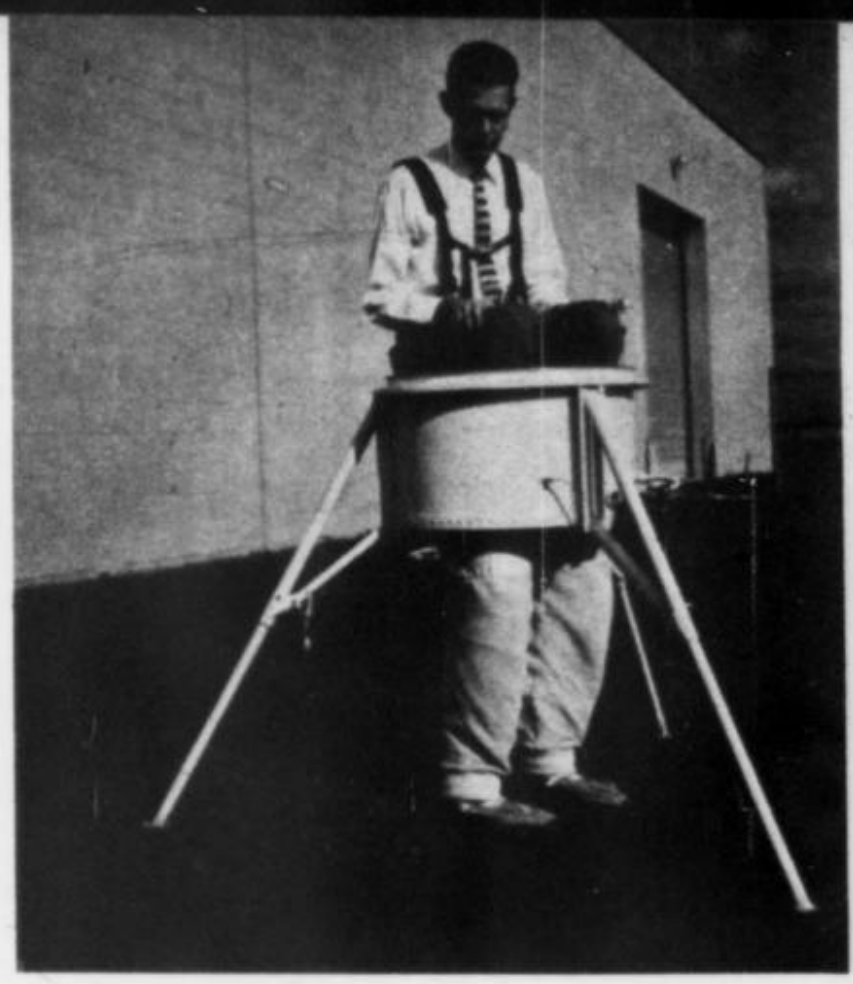
HERE'S WHAT THEY'LL WEAR ON THE MOON

SPACE SUIT encases this lunar explorer setting out with radiation counter and antimagnetic hammer across moon's surface.

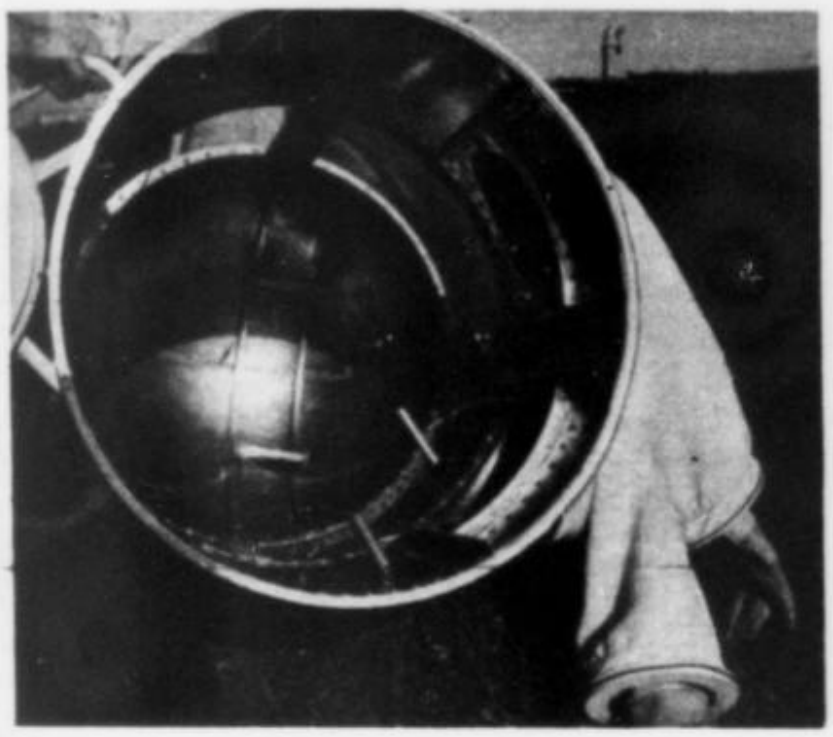
A TWO-PIECE aluminum suit for moon wear has been designed by Republic Aviation. The apparatus maintains proper pressure, temperature, humidity. An oxygen supply and carbon dioxide absorbers keep the man inside breathing easily. The wearer has controls for these functions as well as a radio communication unit, food and waste storage bins, searchlight control, an electric power supply, rest tripod and a built-in seat. The moon's weak gravity will allow wearer to toddle about easily. •

SHOULDER HARNESS holds up the bottom half of the space suit.

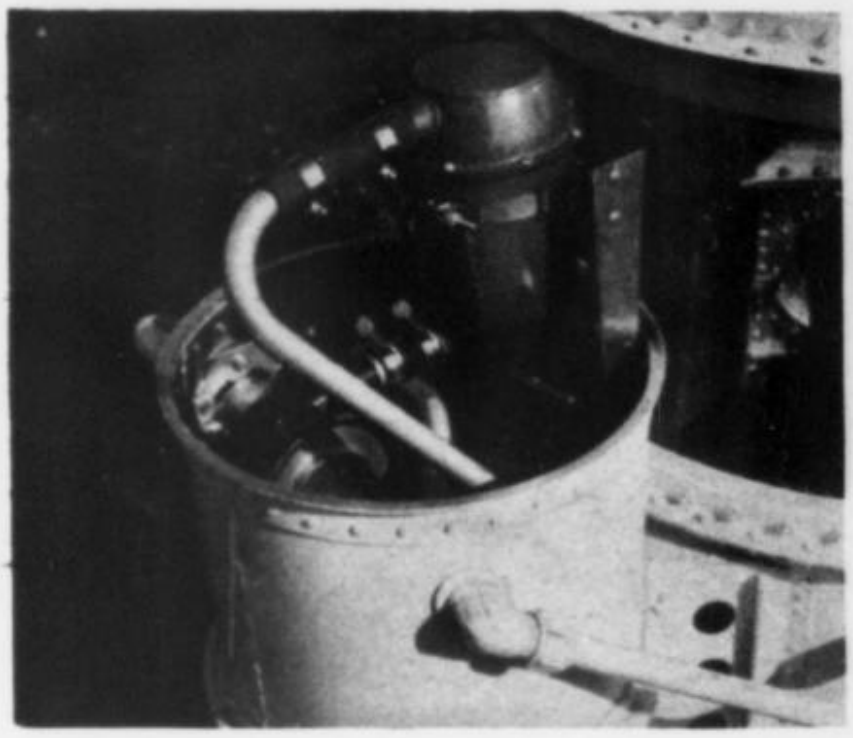
DOUBLE-SOLED safety shoes will make it easier for astronaut to walk on the moon.



RETRACTABLE stanchions can be extended to allow wearer to sit down in the suit.

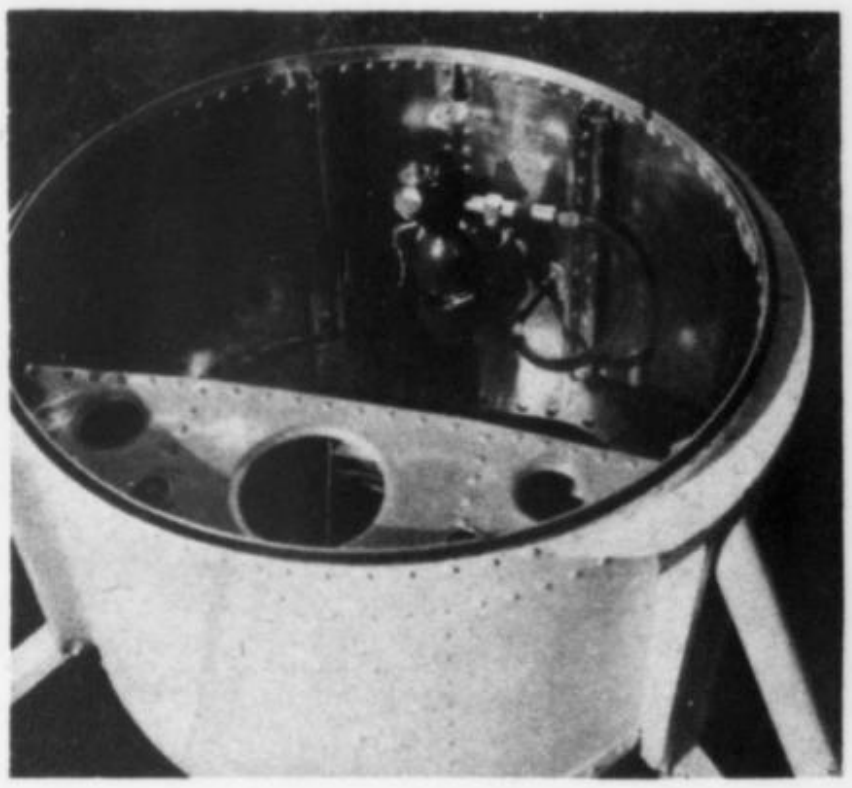


INTERIOR of top half of space suit shows spotlight control and full viewing window.



TANK attached to rear of suit encloses mechanism to purify and recirculate air.

TRANSISTORIZED transceiver in suit permits communication with mother vehicle.



OXYGEN TANK installed in bottom half of suit supplies oxygen to air for four hours.

Electronic
BATTLEFIELD SCOUTS

By Frank Tinsley

ANOTHER duty of the soldier is being taken over by the machine. The screen of far-flung reconnaissance patrols, upon which military commanders have traditionally relied for intelligence of enemy movements, is being replaced by electronic scouts. Radar detects and pinpoints hostile movements through smoke, fog and dark of night. Mobile TV eyes provide the distant commander with a continuously moving picture of the battle as it develops at various points. Infrared snooperscopes can even sense an enemy by vehicle or body heat!

Soon, even the men now required to transport and operate these fantastic scouting gadgets will find their jobs gone. Already flying are robot planes in which the pilot has been replaced by remote control gear operated from a black box miles away. One of these, shown in

ROBOT surveillance drone in action over a battlefield. In background, transport and drone copter are landing Silent Scouts (see next pages).

NIGHT VIEW shows enemy column under surveillance by an MI Silent Scout. Numbers show: 1. TV transmission antenna. 2. Infrared beam projector. 3. Full-circle infrared scanning eyes. 4. TV pick-up and transmitter. 5. Optical range finder. 6. Infrared snooperscope. 7. Sten guns aimed by remote control. 8. Steering motor. 9. Steerable front Terra-tire. 10. Fuel cell powerpack, one on each side of Silent Scout. 11. Remote control propulsion gear. 12. Inertial gyro compass. 13. Rear Terra-tires. 14. (on facing page) Control station for Silent Scout. Observations from several Scouts are correlated here and moving target is pin-pointed on illuminated electronic map. On a repeater map at nearby missile battery, the target's speed, direction and range are automatically computed, waiting missiles are programmed and roar into action. Silent Scout can be made of off-the-shelf components and in a variety of sizes to perform special tasks.

the lead illustration, is the Fairchild AN/USD-5, now under test. Powered by turbojet engines, these unmanned drones can follow land contours at low levels to fool enemy radar, or climb to high altitudes for top deck missions. As they flash over the battlefield, their high speed makes them an almost impossible target for ground gunners. These aerial scouts can carry a variety of observation gear—radar, infrared or photographic cameras—and radio back their pictures in a continuous stream. Thus, if the machine is shot down at any point during its flight, all previously recorded information is safely in the hands of its operators—and no pilots are lost.

The tactics of tomorrow's wars will change [*Continued on page* 160]

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SHOOT-YOUR-OWN ROCKET FLIES 1,000 FEET IN AIR, COMES DOWN BY PARACHUTE

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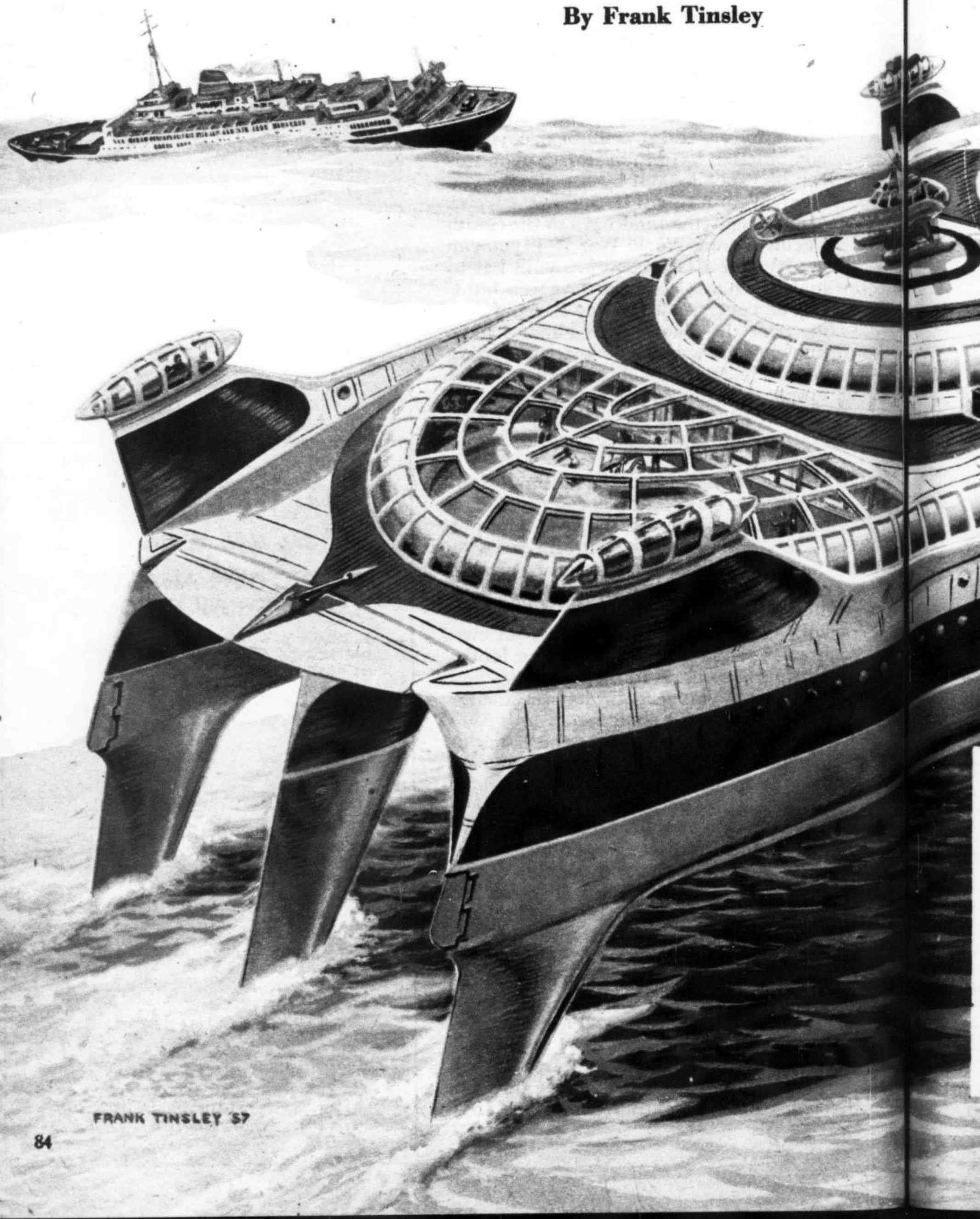
Water Wings For Ocean Liners

By Frank Tinsley



SKIMMING waves at 100-mph cruising speed, hydrofoil-equipped liners will put Europe only two days away via water.

THE Flying Fish is built for speed. You can sense it just by looking at her. The familiar tiers of open decks, the topside rows of conventional lifeboats, the towering masts and obtrusive funnels of the conventional ocean liner are missing. You notice instead the rounded glass deck enclosures, the submarine-type conning tower and the rakish stern fins with their bullet-like dock bridges.

This ship is different. Her broad beam and twin catamaran hulls indicate tremendous stability. The slick superstructure promises super speed and the trim silhouette embodies streamlining you never imagined would be on a huge ocean-going liner.

MI predicts that in the not too distant future ships such as this, equipped with hydrofoils, will skim the sea lanes carrying passengers in luxurious comfort at 100-mph cruising speeds! The tried and proven

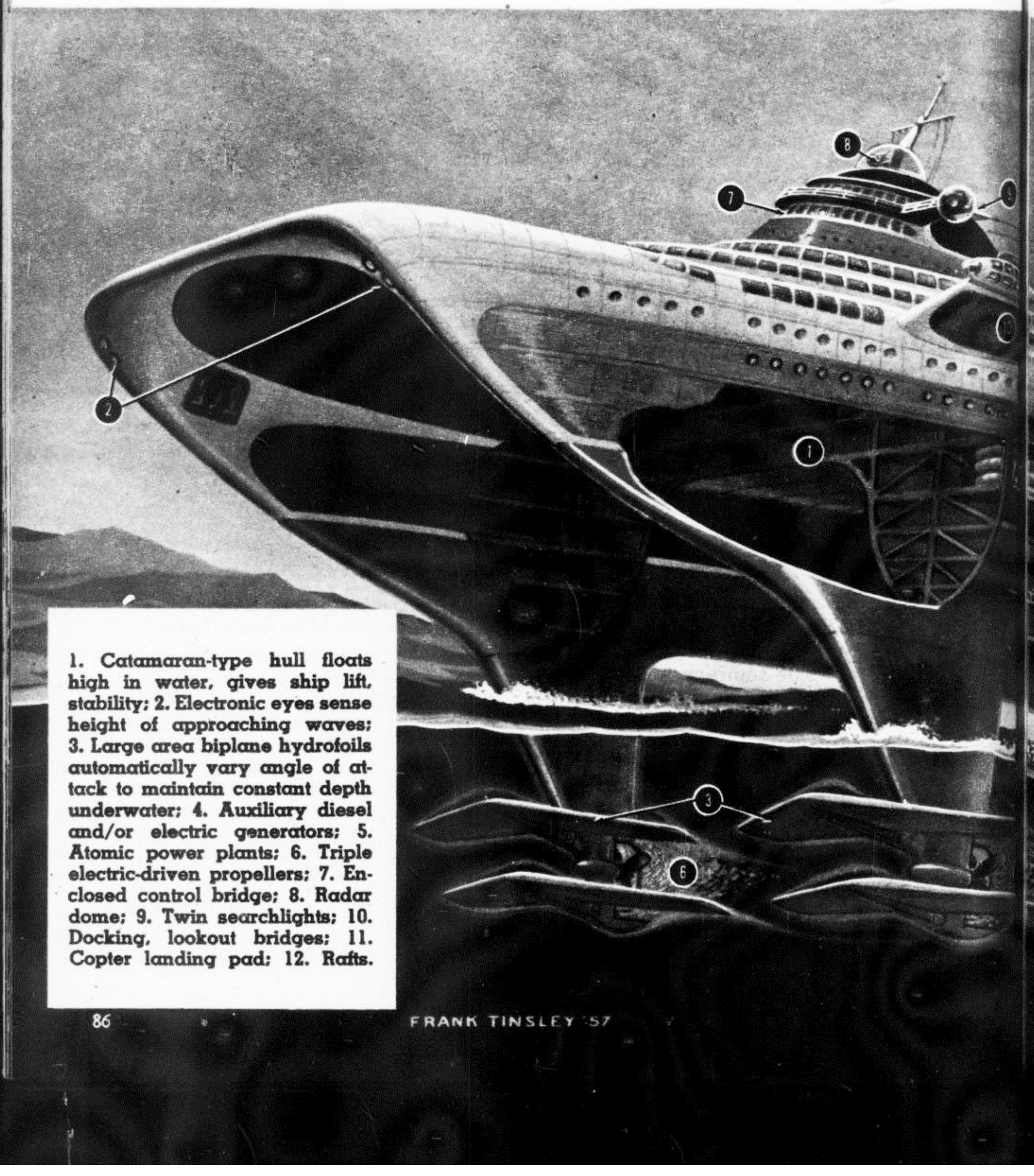
concept making this flying ship possible is in the water wings or hydrofoils which have been called the "first real advance in naval architecture since steam took over from the sail." The hydrofoil is literally a wing that flies through the water. Actually, this concept of supporting a ship on subsurface water wings dates back to 1905 when the first hydrofoil patents were issued.

Many countries experimented with hydrofoils through the years but the one trouble that plagued the successful adaption of them was rough water. They worked fine under smooth surface conditions but if the sea kicked up, it wasn't safe to be aboard a boat equipped with them.

Christopher Hook, an English inventor, finally solved the rough water problem with a unique mechanical wave-sensing device that made it possible to control the angle of the foils underwater and maintain them at a constant depth at all speeds and under varying surface conditions.

Meanwhile, the hydrofoil has had a renaissance abroad. European nations are all busy with experimental models and a number of medium-size boats are actually in service.

The hydrofoil finally seems to be on



1. Catamaran-type hull floats high in water, gives ship lift, stability; 2. Electronic eyes sense height of approaching waves; 3. Large area biplane hydrofoils automatically vary angle of attack to maintain constant depth underwater; 4. Auxiliary diesel and/or electric generators; 5. Atomic power plants; 6. Triple electric-driven propellers; 7. Enclosed control bridge; 8. Radar dome; 9. Twin searchlights; 10. Docking, lookout bridges; 11. Copter landing pad; 12. Rafts.

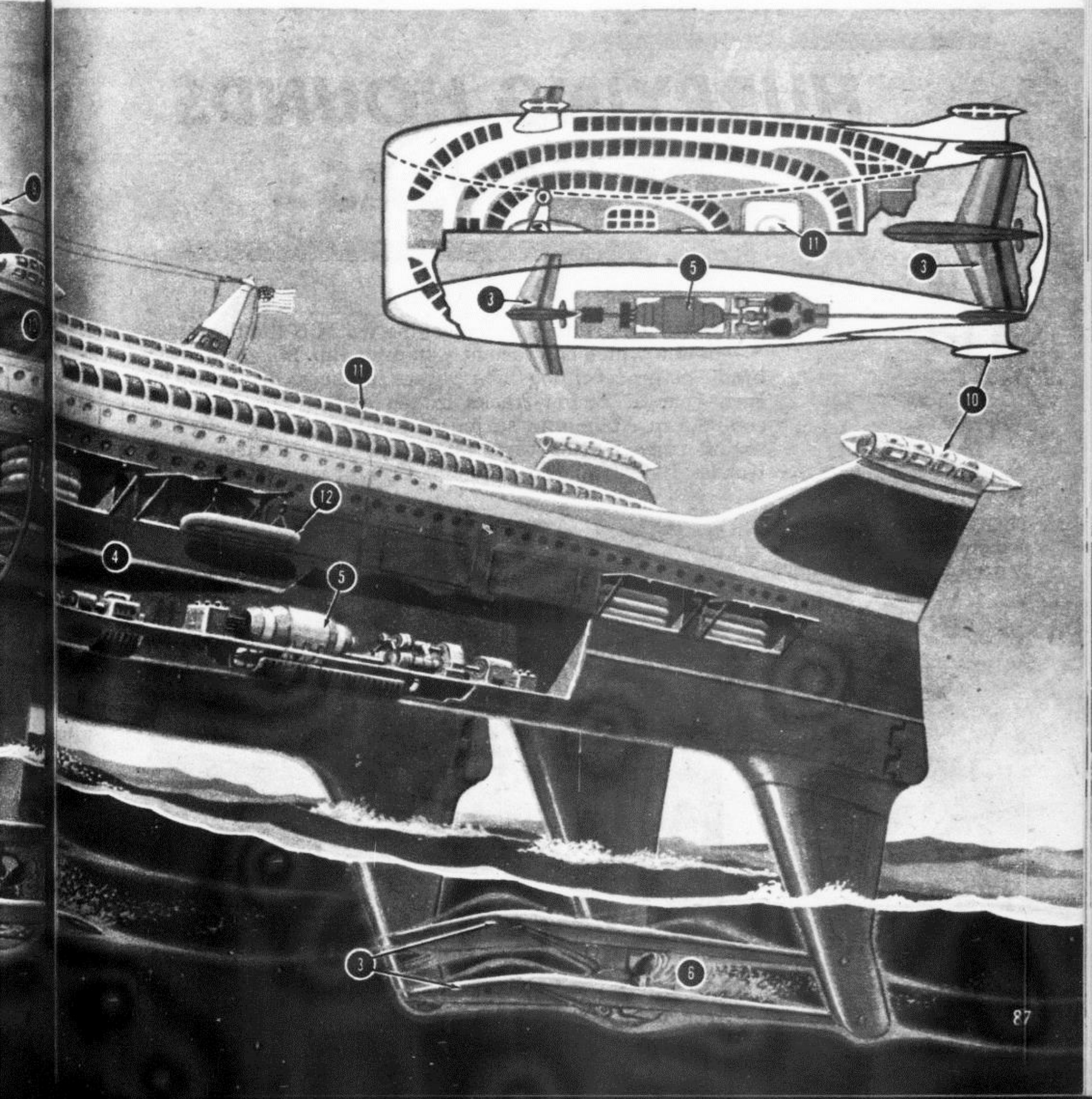
FRANK TINSLEY '57

the verge of acceptance. One U. S. admiral has envisioned its use on aircraft carriers. "Imagine a flattop that can go twice as fast on the present power, while providing a far more stable flight platform," he said.

MI has translated the advantages of the hydrofoil into peacetime use, presenting the future hydrofoil ship as an express liner. Twin-hulled for speed and stability both afloat and "aflight," it saves weight by the lavish use of light metals and materials. This, plus its 100-mph cruising rate, permits relatively smaller lifting areas and overcomes the problem of overlarge foils.

The biplane arrangement makes them still more compact and the substitution of electronic wave-sensing gear for Hook's mechanical wave-sensing device permits cleaner design and less docking difficulty. Triple underwater propellers and rudders, driven by twin atomic and/or electric power plants, save on fuel space and greatly increase maneuverability.

A single class ship, the Flying Fish uses advanced ideas already in use—like life rafts in enclosed compartments near the waterline instead of lifeboats, for instance. MI's dream boat is a sound concept of ocean travel in the future. •



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FEBRUARY
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"MODEL T" OF HELICOPTERS
DESIGNED FOR POST-WAR CIVILIAN SALE
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4TH ANNUAL WORD GAME CONTEST
MORE THAN $5,000.00 IN PRIZES

CYCLES PREDICT THE FUTURE • SEE PAGE 58

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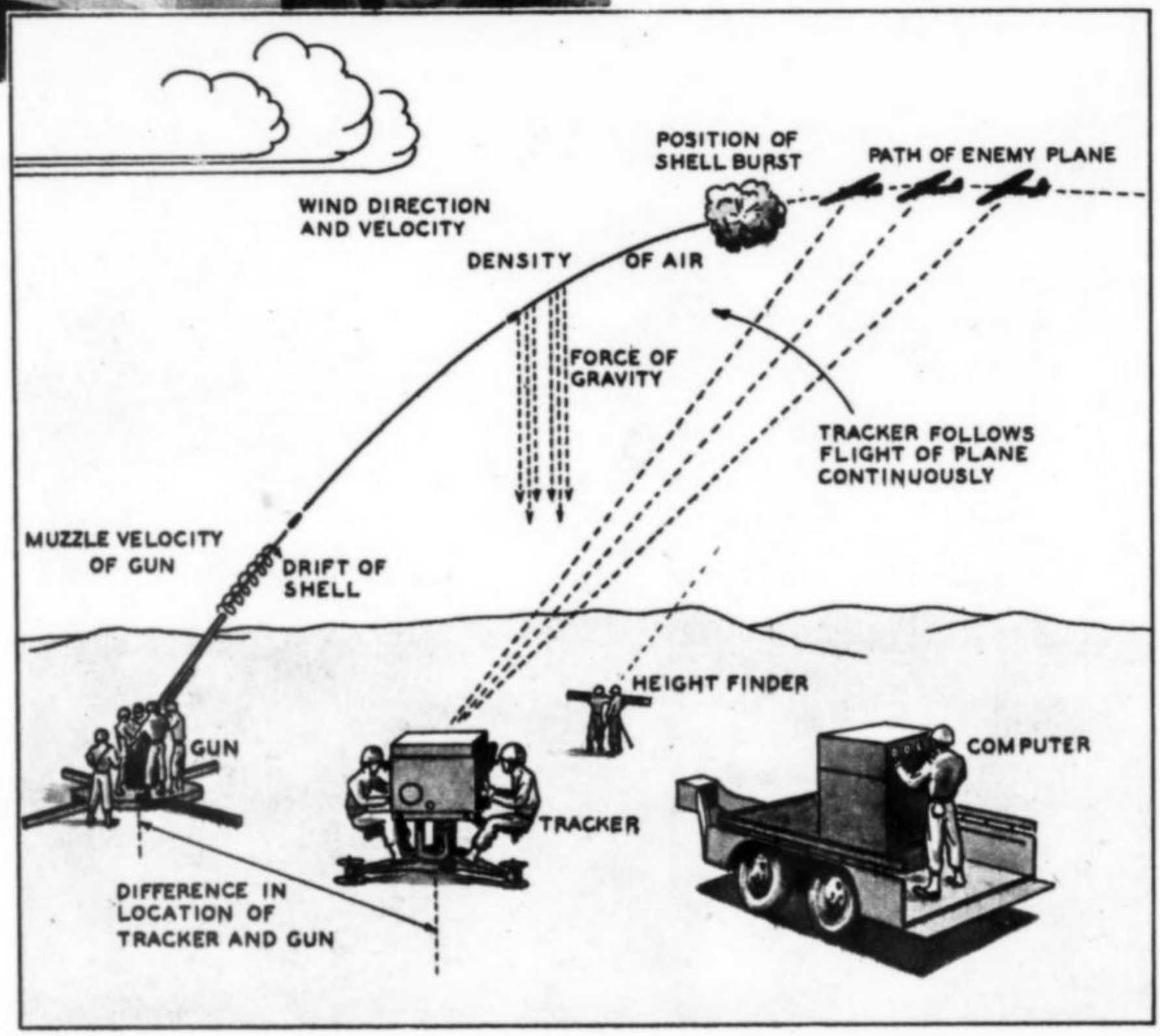
ACK-ACK BRAIN

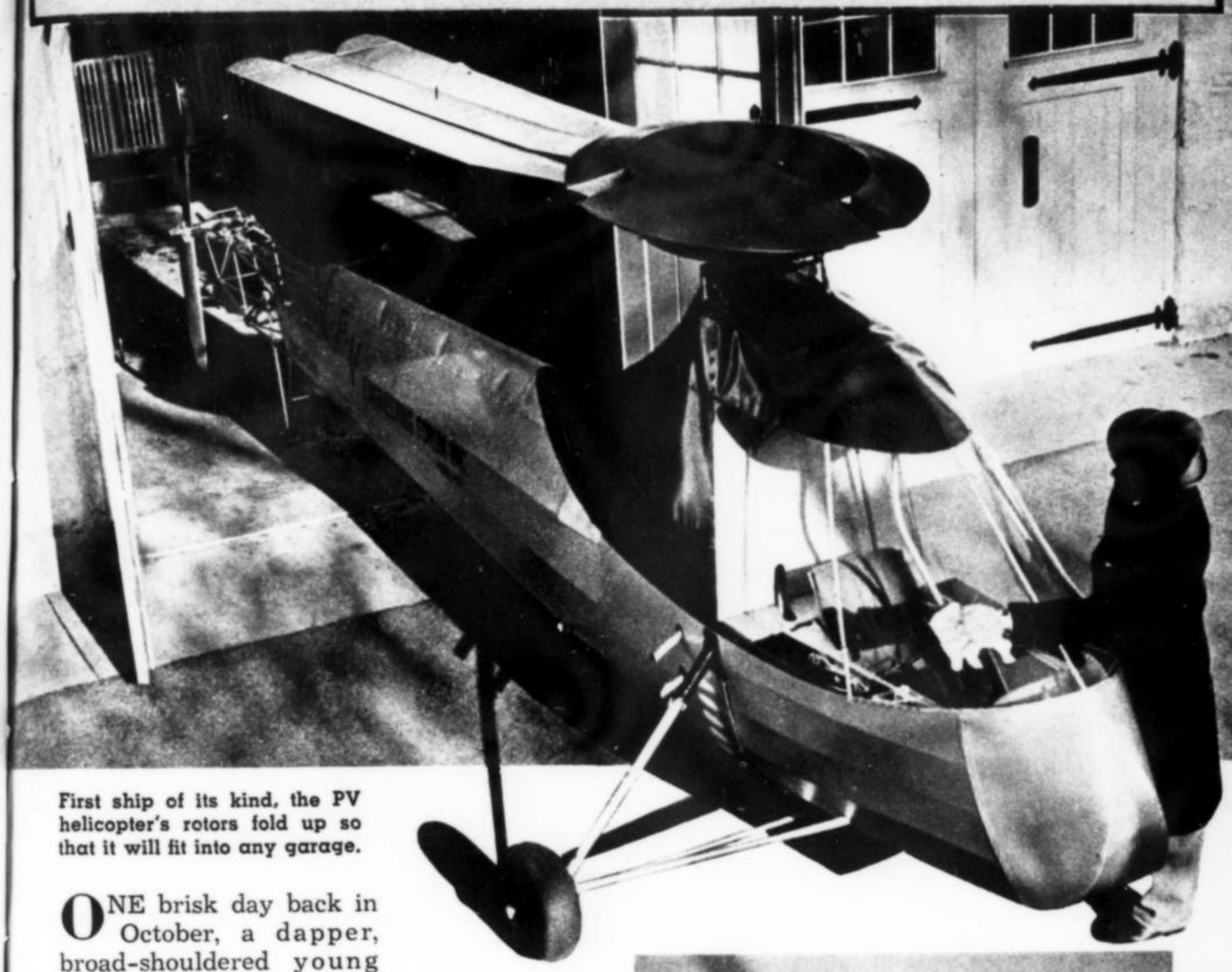
IN THE sketch below, an electrical brain, called the computer, absorbs the facts given it by the tracker and the height finder—is aware of all the other data given in the sketch (anti-aircraft ballistic problems)—and then directs the gun on when and where to fire. The electrical information given out by the computer is translated into mechanical movement at the gun to swing its muzzle automatically to the correct vertical and horizontal angle to blast the enemy plane. While operating continuously during the tracking period, the computer is able to make instantaneous corrections of any changes in the vital data. All the Army would say about its new advance in the art of fire control, the M-9, was that it enabled ack-ack to tear target sleeves to shreds.

At left—in foreground is the computer. The operator tracker can be seen in background.



MODEL T OF HELICOPTERS

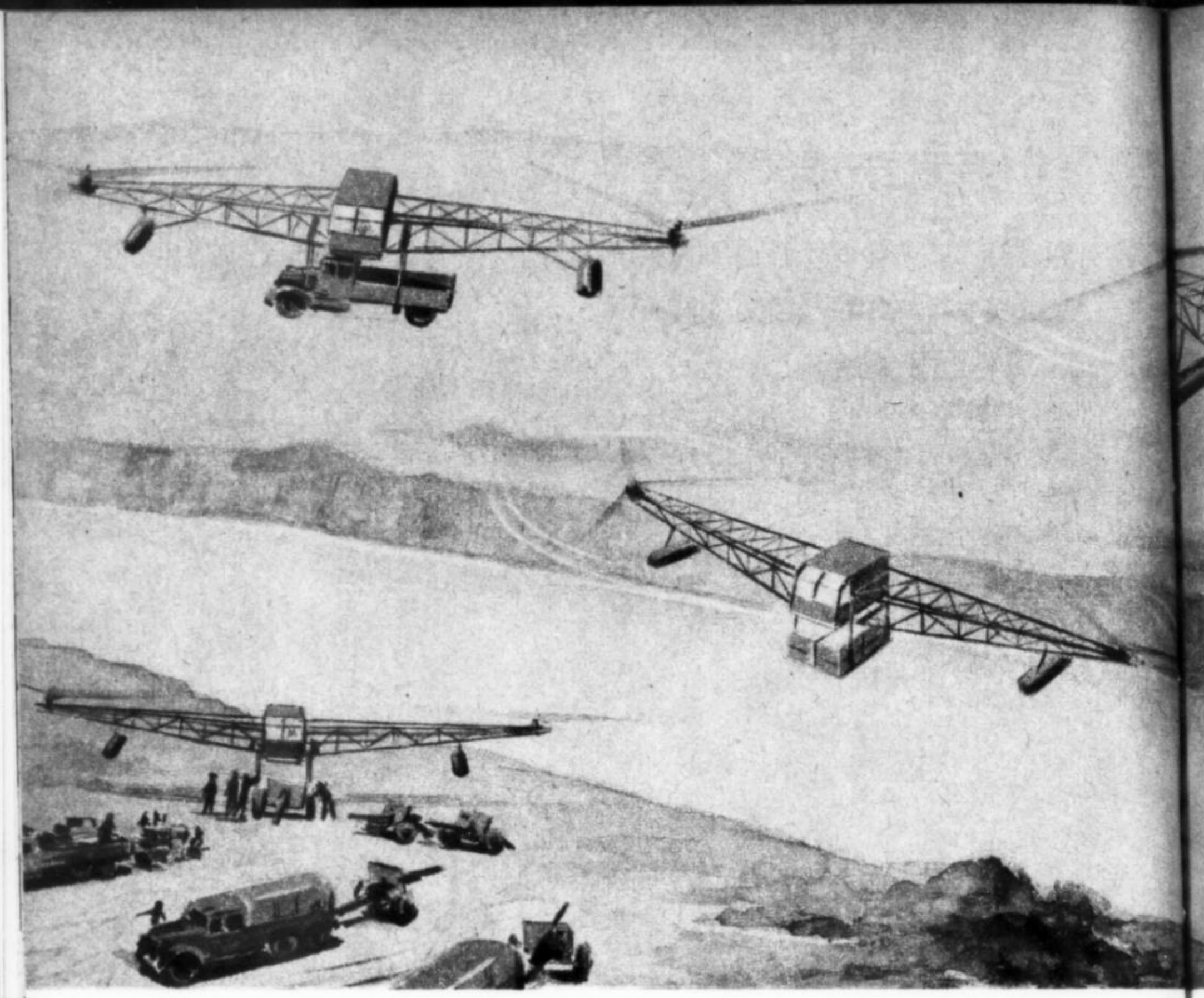
by Bernard Wolfe



First ship of its kind, the PV helicopter's rotors fold up so that it will fit into any garage.

ONE brisk day back in October, a dapper, broad-shouldered young man made his way across the Washington National Airport to a toy-like little ship, followed by more than one pair of skeptical eyes. Still in his twenties, with a jaunty homburg slanted back on his head, the fledgling pilot looked more like a gridiron husky than one of the 20 crack engineers in America who understand helicopters from the ground up. The military and civilian observers awaited the demonstration of this latest cloud-hopping jeep, with mixed feelings.

As the assembled experts well knew, helicopter flying isn't child's play. It taxes the pilot's nervous system severely. Young Frank Piasecki, far from being a veteran airman, had to his credit a meager 14 hours in a Taylor cub, just enough to entitle him to a student permit. Worse yet, he had chalked



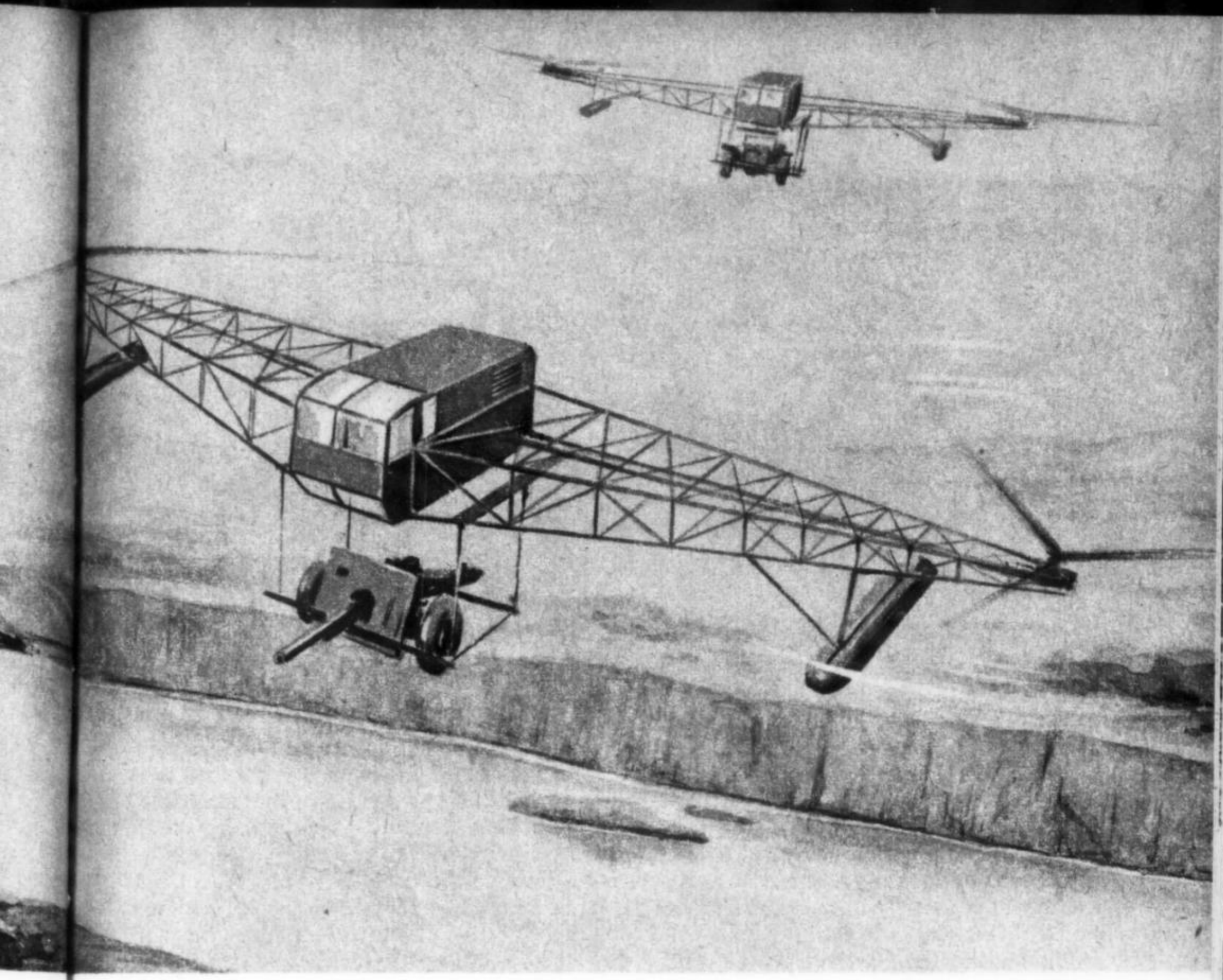
In his research, Piasecki, PV designer, unearthed reports that Germans were using oversize helicopters to carry guns and other equipment across unfordable streams, as shown in the artist's conception by MI's Fred Ripperda, above.

up a mere 16 hours of flying time in helicopters, and was the first American to be granted a helicopter license without first qualifying for the regular airplane pilot's license.

Under the circumstances, this test was doubly important. There would be no old hand at the controls of the new ship to cope with a wobbly stick, vibrations, or any other defect which might pop up under the stresses and strains of flight. If the PV-2 turned in a good performance with such a novice in the cockpit it would speak volumes for the safety and controllability of the new flying windmill.

The experts watched Piasecki climb into the absurd, flimsy-looking little ship with misgivings. How would such a fragile dwarf of a ship, newcomer among rotary-wing ma-

Front view of the PV's controls, showing extreme simplicity of design. Piasecki's left hand grasps throttle.



A closeup of the rotor control, in Piasecki's right hand. The ship goes in any direction the lever is moved.

chines, fare in the hands of this cocky amateur?

The ship itself was a gawky affair, tiny and compact, looking like a hunched bumblebee poised for the takeoff. Like the Sikorsky model, it was equipped with a main horizontal rotor overhead and a smaller auxiliary rotor attached sideways to the tail, but it looked much lighter, smaller and infinitely less substantial than the VS-300. What it would do in the air was anybody's guess.

There was no cause for alarm. Once Piasecki had slipped into the cockpit of the single seater, the rotors began to hum with an angry whir and the machine rose vertically. It hovered a few feet off the ground, climbed higher and turned smartly in its own length, with the absurd assurance of a circus midget. With the ease of an old campaigner Piasecki flew forward at a good clip, backed up, banked, turned sideways and descended vertically to hover again while the news photographers clicked their shutters. The

This photo shows the smallness of the PV-2. Piasecki uses the old-fashioned automobile horn mounted on the lower strut to warn off pedestrians as he lands.

oldtimers in the audience sat up and took notice. The demonstration had gone like clockword.

Later, with the same good-natured nonchalance, the young designer took off from a private driveway in Falls Church, Va., and buzzed down the street to a gas station. There he waved three fingers to an attendant, who filled up the gas tank and wiped off the windshield. Taking off again, Piasecki flew to a nearby golf club, landed at the first hole, and proceeded to tee off with his waiting friends, much to the delight of the newsreel cameramen who trailed along to record the feat. "I just wanted to show it could be done," Piasecki explained later with a grin. "There's been a lot of talk lately about how you can land in tight places with a 'copter, but nobody's got around to actually doing it. I thought you fellows might like to see that it's more than high-powered talk." The gas-station clearance in which he had landed was so laid out, with a treacherous two-foot fence enclosing it, that hardly more than 25 square feet were available to Piasecki when he inched his way in. Both ship and pilot, despite their tender years, had turned in a performance as smooth as silk.

Although there are upwards of 26 rotary-wing aircraft projects now on the boards or under construction in this country, Piasecki's PV-2 is the second helicopter to get into the air for a full-fledged, all-out demonstration spin. First ship of its type to be fully streamlined (it was styled by Harry S. Pack, helicopter expert for Pennsylvania Central Airlines), it has a gross weight, including pilot and fuel load, of only 1,000 pounds, and in storage, with the three blades of its 25-foot main rotor folded back, it is only 22 feet four inches long, seven feet seven inches high, and eight feet wide. Main rotor blades hit a tip speed of about 350 miles per hour; the ship has a landing speed of zero, can cruise at 85 miles per hour and back up at 20 miles per hour. When it is travelling at a forward speed of 50 miles per hour, the PV-2 will climb at a rate of 1,000 feet per minute, which is about as fast as the ascent of a Taylor cub. If forward speed is eliminated to make the climb directly vertical, the rate is about 600 to 700 feet per minute.

This lilliputian single-seater, even as it stands now, is more indicative of the postwar low-cost helicopter than any other model thus far revealed to the public. In its present form it is a finished vehicle, looking very much like the aerial counterpart of the sport coupe—the Model T of the skyways. With only slight alteration of its dimensions, including some added area to the rotor disc, and a little stepping up of power, the craft can easily be designed to accommodate two, three, or four passengers. The PV midget is the closest thing to a sky-riding runabout that we've seen yet.

In its main features the PV's mechanism resembles that of the Sikorsky and other

models of orthodox two-rotor design. But while lift and control principles are conventional, new design details simplify the mechanics of operation and make the craft extremely easy to handle.

On the pilot's left, over in a corner, is a ratchet lever, something like an emergency brake in appearance, which controls the "total pitch" of the main rotor's blades—the constant pitch at which all the blades make the complete revolution. The pilot can either operate the throttle independently or adjust it to work automatically with the total-pitch lever, as he prefers. On the other hand, "cyclic pitch"—the pitch of each individual blade, which can be varied in different phases of the revolution, imparting a dip to the fuselage in one phase and a lift in the opposite phase—is adjusted by the main control stick, a long rod which curves down vertically from overhead. This stick is pushed in whatever direction the pilot wishes to travel: forward to go ahead, sideways for movement to right or left, and backward for movement to the rear. All this stick really does is to make the blades bite deeply into the air in one phase, lifting the craft on that side, and bite shallowly in the opposite phase, depressing the body on that side. Movement will follow in the direction of the tilt. With an overhead stick, rather than one that comes up between the pilot's knees from a slot in the floor, there is more room in the cockpit and it is easier to keep clean.

So carefully has the rotor been designed, with its blades balanced exactly against each other as well as absolutely, that there is no vibration or wobble in the control stick, and a minimum of strain is imposed on the pilot. It is because of this ease in control, cutting nervous effort down to next to nothing, that a novice like Piasecki could fly the PV without prior helicopter experience. As a matter of fact, Piasecki can boast that he test flew his ship back in March at the same time that he was learning to fly any kind of helicopter.

Rudder action in the craft is supplied by a five-foot torque propeller, which is shaft-driven, where as the Sikorsky rear rotor is turned by a belt-drive. As in all helicopters of this type, the auxiliary rotor is necessary to offset the torque or twisting effect of the main rotor, which, if not counteracted, would swing the fuselage in circles in a direction opposite to that of the main rotor's blades. (The De Bothezat co-axial helicopter meets this problem by having two main rotors mounted on the same axis, one above the other, revolving in opposite directions at the same speed so that their torque effects are cancelled out.) When movement directly forward or backward is desired, the blades of the rear prop are pitched, or "feathered," by the foot rudder bars just enough to cancel out the torque effect of the main rotor. As a result, there is no turning motion, and the ship goes straight ahead or backwards, depending on whether the control stick is moved forward or back. When movement to one side is desired, the control stick is pushed in that direction and the appropriate foot rudder bar is pressed down—left for left, right for right.

The Franklin four-cylinder, air-cooled engine used in the PV-2 is a 90-horsepower job, of the 180-degree opposed flat type. This engine is mounted with its crankshaft upright just rearward of the cockpit. In order to stand the engine on end, Piasecki and his engineering staff had to work out a special oil scavenge pump under the engine. To cope with the reduction gear problem, Franklin and Lycoming are said to be working right now on a vertical engine specifically for helicopters.

Although most of the design features which reduce vibration in the PV and simplify its controls are secret, it has been revealed that the movement of the engine in its rubber mounting is absorbed by a universal joint placed in the drive shaft between the rotor hub and the gear take-off. About five percent of the engine's power is consumed by the centrifugal cooling blower mounted around the clutch assembly—blower cooling is essential, since the craft eats up full power for sizable periods even when standing still. At present the PV has a ceiling of 5,000 feet and can hit a top speed of 90 to 100 miles per hour, but Piasecki is confident that these limits can be raised without much trouble. "We haven't been worrying about speed and ceiling," he says. "What we wanted to do from the beginning was to simplify the controls and increase the safety factors. By spending ten times the usual engineering time on each design detail, we've pretty well licked the problems we set out to tackle. Later on, when the problems come up, we can fool around with speed, ceiling, passenger capacity, and special automatic safety devices." The thoroughness of Piasecki's engineering is indicated by the fact that the PV has flown successfully, without anything but routine detail changes, since it first took to the air last March.

Piasecki doesn't claim any radical innovations of a general nature—his machine, like most others, utilizes the tried-and-true torque reaction method developed by Von Baumhauer. But his real contribution is a remarkably simplified control. Movement in any direction is obtained by simply moving the control stick in that direction, and the machine can be tilted or rolled on its own axis without any translation. And what is unique is that the time lapse between the stick's motion and the resultant motion in the machine is very much shorter than in previous control systems. This contribution will be a real boom to postwar helicopters, since it makes piloting immeasurably easier. The operator, instead of having to *anticipate* a control motion—which requires laborious practice in timing before he gets his reactions right—now can get an immediate response from any movement of the stick. This innovation brings the helicopter one giant step nearer the capacities of the average man.

Today Piasecki is still wrapped up in wartime

[*Continued on page* 161]

Private And Public 'Copters

HELICOPTER designers are covering the transportation field from every angle. Above is a model of a fourteen-passenger air bus used by Greyhound Bus Lines to convince the Civil Aeronautics Board that it should be granted permission to use air buses in local air service over 49,130 miles of routes. Raymond Loewy designed the cloud-bound bus in collaboration with Igor Sikorsky. At the right is a plywood 'copter designed for private use. This one has twin sixteen-foot rotors and a vertical stabilizer instead of an aft rotor. Fred Landgraf, Los Angeles engineer, built this one. The tear drop design helps greatly in dispelling the clumsy, home-built look so common to many of these machines.

Now Tanks Have An Ambulance

THE Tank Recovery Vehicle, our War Department's M-25, waits for a tank to amble onto its huge chassis. Weighing over forty tons, this armored monster carries tanks to front lines and hauls disabled ones from battlefields for repairs. The M-25 makes it possible for tanks to enter battle with full fuel loads and cool motors, an invaluable assist. It can operate for four days on its own. It is also a "mother ship" to light, motorized equipment that has broken down.

BOMBS FOR THE MIND

by Charles J. Rolo

Author of "Radio Goes To War"
(G. P. Putnam Sons)

How we're winning the battle of the kilocycles—on the invisible radio front.

GERMANY is "hanging on the ropes" in the battle of the air-waves—the propaganda front she opened so brazenly at the outbreak of World War II. Once the "secret weapon" that helped pave Hitler's path of conquest, radio propaganda is now rushing his downfall.

Thanks to the blunders of German Propaganda Minister Goebbels, the Allied short-wave radio has been able to seize and hold the initiative on this important invisible salient. When the Reich was successful in her land and air blitz, German psychology—a mixture of suggestion and exaggeration—was devilishly effective.

But now that the tide has turned, it is evident that Goebbels over-reached himself; for "doomed" Britain is now dishing it out; America, who, the Germans were assured, would soon be knocked out, is in there fighting at the Fuehrer's personal invitation, and the "annihilated" Russian armies have come back time after time to deal staggering blows to

Directional short-wave antenna of the BBC. Allied propaganda broadcasts are beamed to the world over this odd apparatus

AVIATION • INVENTIONS • HOBBIES

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"YOU CAN FLY MY HELICOPTER"

By IGOR SIKORSKY · See Page 58

PLANT A VICTORY GARDEN • SEE PAGE 90

MAY 1943

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SPECIAL FEATURES

On the Cover: This is the first Kodachrome ever published of the newest version of Igor Sikorsky's great VS-300 helicopter—forerunner of the family plane of the future. For story and more pictures, see page 58. MECHANIX ILLUSTRATED Kodachrome by Norman C. Lipton.

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NEXT MONTH!

In this issue you'll find the latest news of Igor Sikorsky's helicopter. Next month, we bring you news of another candidate for the title of "Family Plane of the Future"—the Convertaplane. The Convertaplane can hover like a helicopter, take off and land almost vertically—but it can speed through the air at 300 miles an hour, and can even be driven along a highway, like a car! Before long, you'll be hearing plenty about the Convertaplane—for the ground-floor facts about it, be sure to read the story by its inventor, Gerard Herrick, in the June MECHANIX ILLUSTRATED!

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Latest thing released in helicopters is this Sikorsky-built Army ship. Main rotor is approximately 36 feet in diameter, steering rotor at tail, about 7½. Like its smaller sister ship, it can fly in any direction, including straight up and straight down. Army may use this type of ship for message carrying and ambulance work. Rough-sea rescues might be made by rope ladder as shown while ship hovers.

YOU CAN FLY MY HELICOPTER

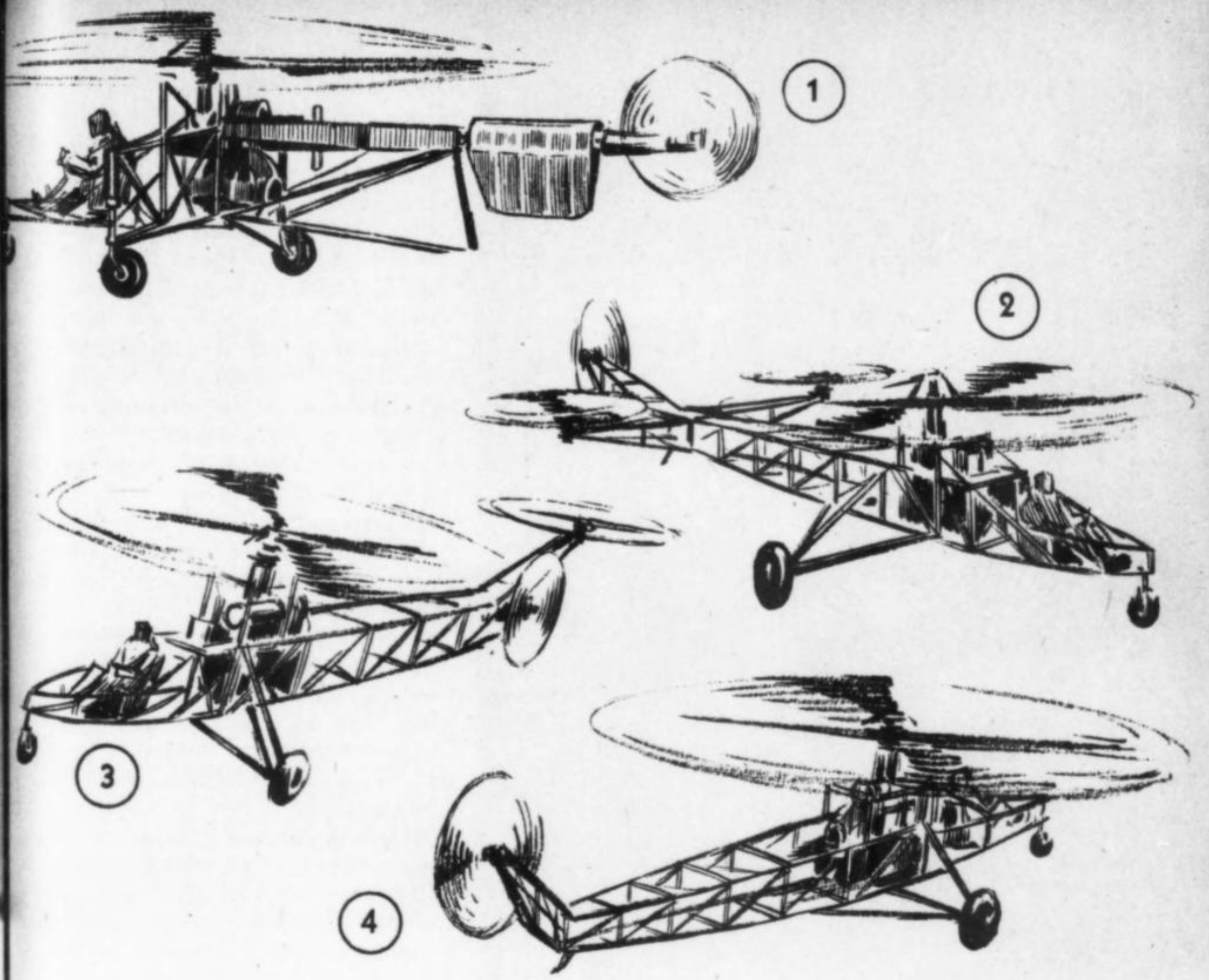
as told to George Daniels

by Igor Sikorsky

Licensed helicopter pilot No. 1, designer Sikorsky enjoys the thrill and the experience of personally flying his amazing wingless aircraft. He has flown these ships in scores of experimental hops, and also set the world's sustained flight record for helicopters, yet neither he nor any of his test pilots has ever so much as scratched a finger in a helicopter.—When he says they're safe, he means it.

YOUR family helicopter is no longer an idle dream, for what may well be the direct forerunner of the "heli-flivver" is already flying. The present ship is a 100 horsepower ship, with optional installation of conventional wheel-type undercarriage, or pneumatic rubber pontoons that enable it to take off or alight on either land or water, or even on mud, snow or ice.

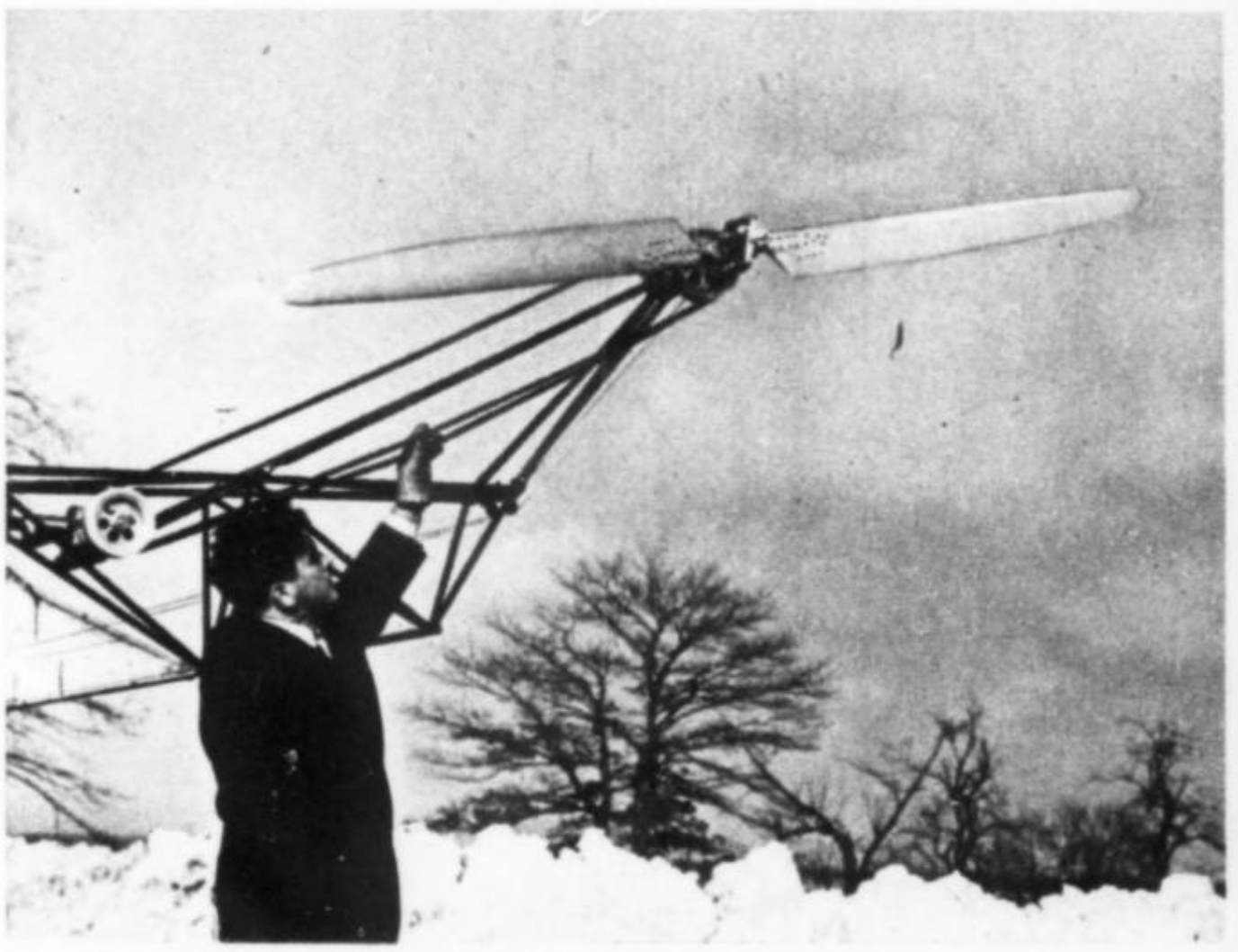
As a result of recent improvements, it is doing the things today that the private owner or commercial pilot of tomorrow will want his ship to do, and it is doing them safely and economically. A mere touch of a lever whisks you straight up



Ship No. 1 was first successful Sikorsky helicopter. Controls were on same principle as those now used. Pilots and engineers lacked experience, so tried types 2 and 3 before returning to original idea (4). Modern fuselage eliminates tail fin.

into the sky in this ship, a slight movement of a control sends you scurrying across the countryside. And all the while you know that the patchwork view below contains a thousand airports—for you can land safely almost anywhere.

This ability of the helicopter to land where other types of aircraft cannot, makes it useful for a wide variety of purposes. The new Army helicopter, for example, has not only hovered stationary in mid-air, but has also shown that a man can safely de-



Patent Engineer V. Roxor Short points to rudder propeller. This steers helicopter by pulling tail to right or left when corresponding rudder pedal is pushed to vary pitch.

The takeoff. Engineer rests hand on helicopter's nose as ship rises slowly, to demonstrate perfect control. Wind is about 20 m.p.h.

Hovering over its parking space after takeoff, ship prepares to back away from MI camera.

scend from it on a rope ladder.

In its original form the experimental ship carried three 46-inch radius propellers at the tail for control. One propeller faced sideways as at present, for steering, and the other two faced upwards at the ends of outriggers on each side. All three had variable pitch blades, controllable by the control stick in the cockpit. When the stick was pushed forward, the two propellers which faced upwards were readjusted to pull upwards, lifting the tail, and depressing the nose. This caused the ship to move forward. The reverse movement of the control stick caused an opposite effect, and produced a backward motion of the ship.

Pushing the stick to either side caused the tail propeller on that side to pull downward while its mate on the opposite side pulled upward, causing the ship to tilt in the direction the control stick was moved.

During the summer of 1941, the main lifting rotor was changed so that the pitch of the individual blades could be varied as they passed each side of the ship. Thus it was possible to cause the main lifting rotor to tilt sideways, controlling the craft in roll and eliminating the need for the two horizontal outriggers at the tail. In their place, one horizontal tail propeller was mounted directly above the tail of the fuselage, facing upwards, and the steering propeller facing sideways at the tail remained as before. The tail propeller which faced upward, lifted or depressed the tail as the stick was moved forward or backward respectively. The side pro-

Continued

YOU CAN FLY MY HELICOPTER

peller continued to act as a rudder, pulling the tail to the left or right when the corresponding rudder pedal was pressed.

The next step in the refinement of the helicopter consisted of redesigning the main rotor pitch control so that the pitch of each individual blade could be varied throughout its entire circuit. Thus, if the pilot wished to point the nose of the ship down, he would move the stick forward as usual, but the controlling effect came from the main rotor. By feathering the blades in their cycle, each blade could, for example be made to decrease pitch as it passed the front of the ship, and to increase pitch as it passed over the tail. This would tilt the rotor forward and cause the ship to tilt forward and, if continued for a short time, to actually move forward.

This system of cyclical pitch control has been found excellently satisfactory, and is the type now used on the test ship. Only one rotor in addition to the main one is needed with this arrangement, and that one faces sideways at the tail to act as a rudder.

Less complex than your automobile, the private helicopter will lend itself easily to production when the time comes, special purpose ships doubtless being among the first civilian machines to serve the public. It is not difficult to see how the helicopter-ambulance, for example, could perform invaluable work in otherwise hopeless instances. It could land and take off without danger in the soft mud of flooded areas, or in the deep snow of an isolated forest clearing. Even the roof of a mountain cabin is an airport for a helicopter.

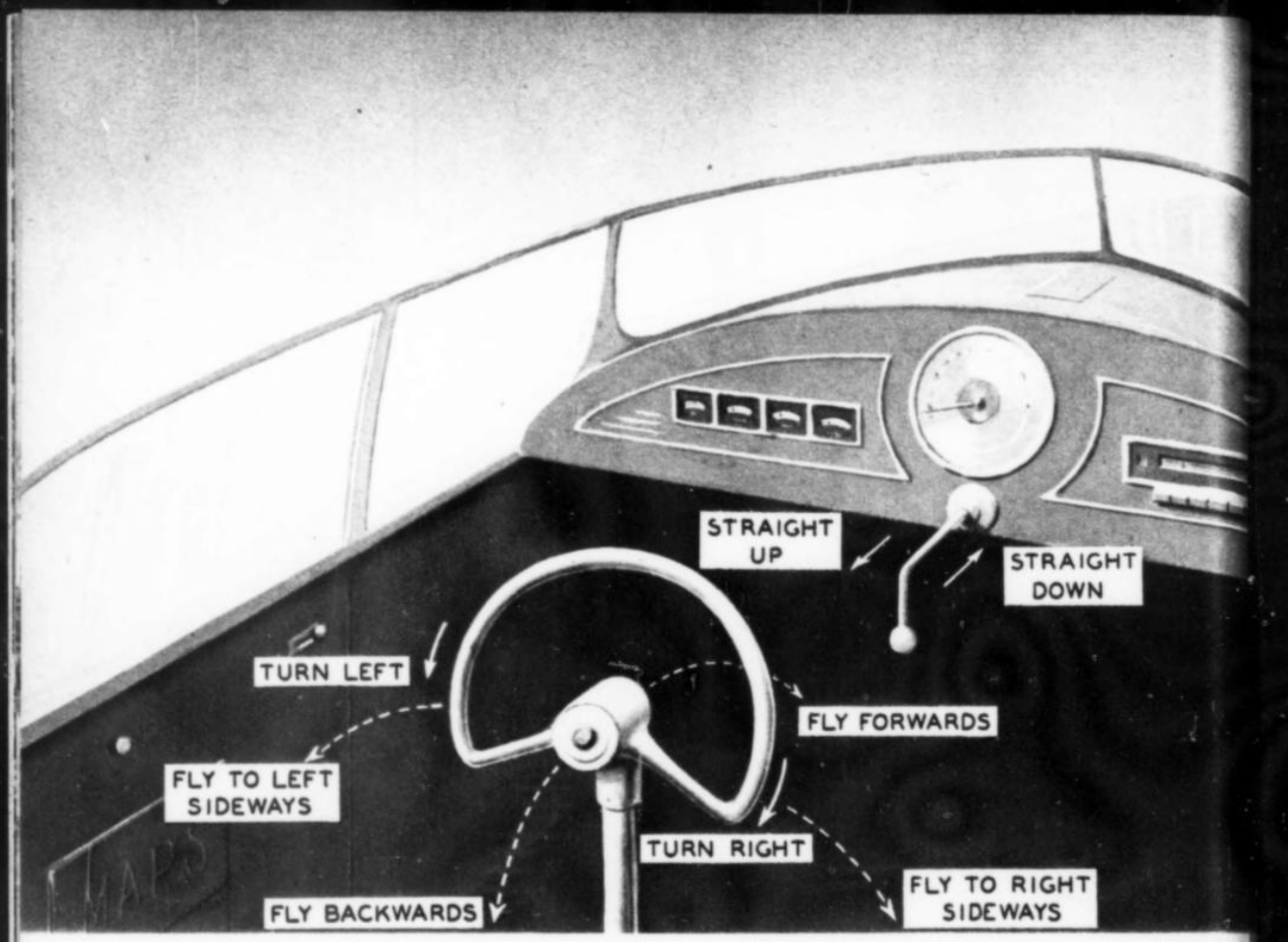
In air mail use, the helicopter could speed the step between mail plane and post office by carrying the mail directly from the airport to post offices in central areas of towns and cities. Landings would

3

Ship backs out of parking area at walking pace, under perfect control —despite rising wind which blew camera tripod over a moment later.

4

Climbing straight up a little higher, as pilot smiles down at camera. Helicopter is no noiser than sport plane. Rotor makes swishing sound.



Artist's version of future helicopter cabin. This control system would eliminate rudder pedals used on today's ship. Airplane pilots prefer rudder pedals, auto drivers may like their airflivvers with wheel and perhaps a throttle they can "step on."

not be essential, along these aerial mail routes, as today's experimental helicopter has already demonstrated its ability to pick up or deliver articles while hovering in mid-air. However, it is difficult to conceive of a post-office, on or near which a helicopter could not be landed.

The controls of the helicopter are simple and easy to master, being practically the same as those of an ordinary sport plane. Perhaps the chief difference lies in a lever beside the seat called the "main pitch control lever." You pull it back—and the ship rises straight up. By using the other controls simultaneously, you can rise at any desired angle.

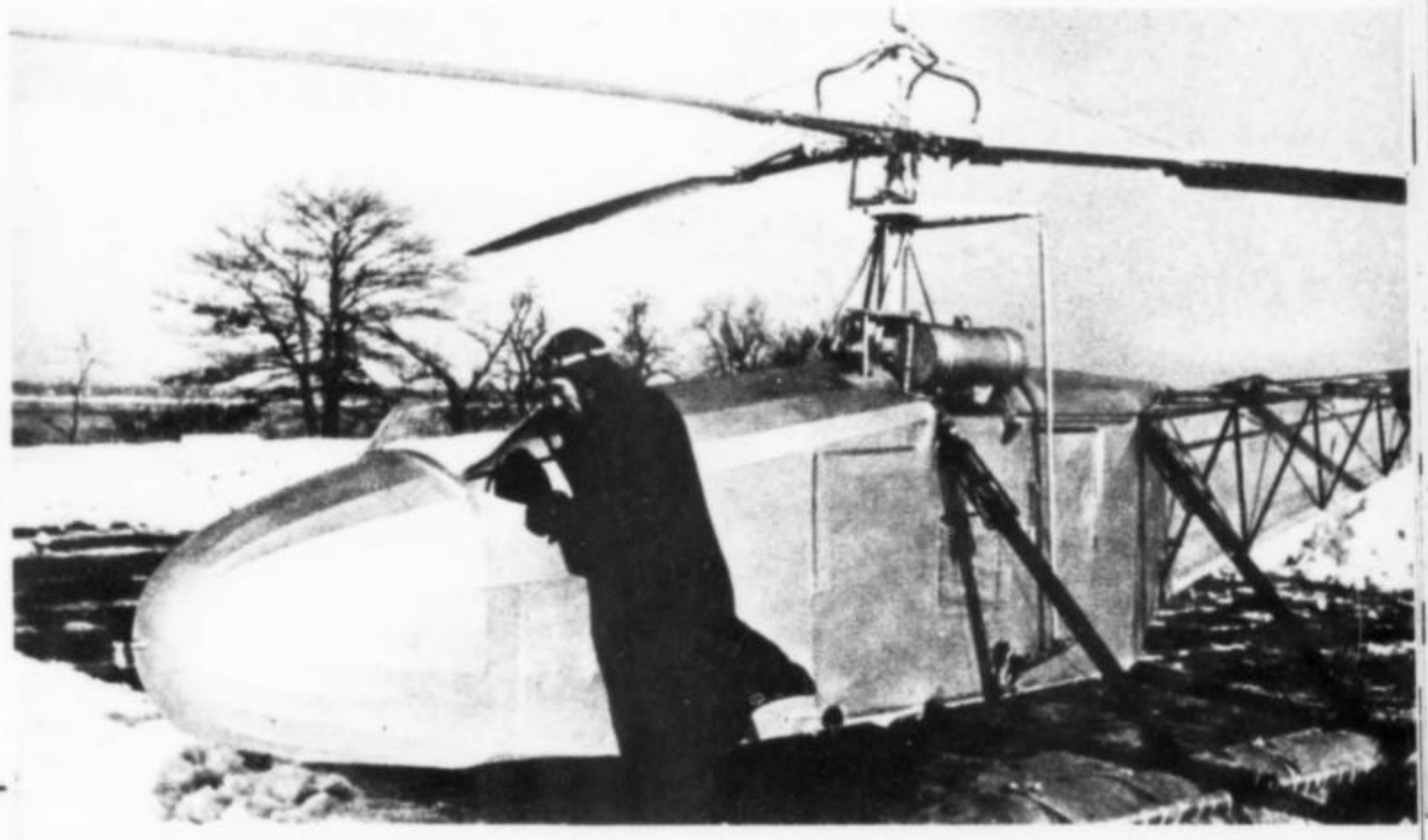
Perhaps one of the effects of the general use of private helicopters will be that of developing residential areas far from business centers. The healthful atmosphere of a lofty mountain retreat can easily be the home environment of the commuting business man. A hundred mile trip to work is only an hour's ride in a helicopter, and you needn't wonder how you'll get to the office if the weather happens to be foggy. Your helicopter can take off or land vertically as slowly as one mile an hour, or less if need be. It can travel forwards or backwards at an equally low rate of speed, or even sideways when the occasion demands. Once in the air, a few simple navigation instruments will suffice to take you to your destination regardless of visibility, for it is always possible to descend at a snail's pace to check your location by road signs if you're in doubt.

If for any reason, it should become necessary to land in a strange area, you have the assurance that your ship can come in even with a dead engine, at practically walking speed. It is not by any means limited to vertical ascent or descent, however, for the helicopter can glide in any direction with or without power. If your engine should fail, it is a simple [*Continued on page* 131]

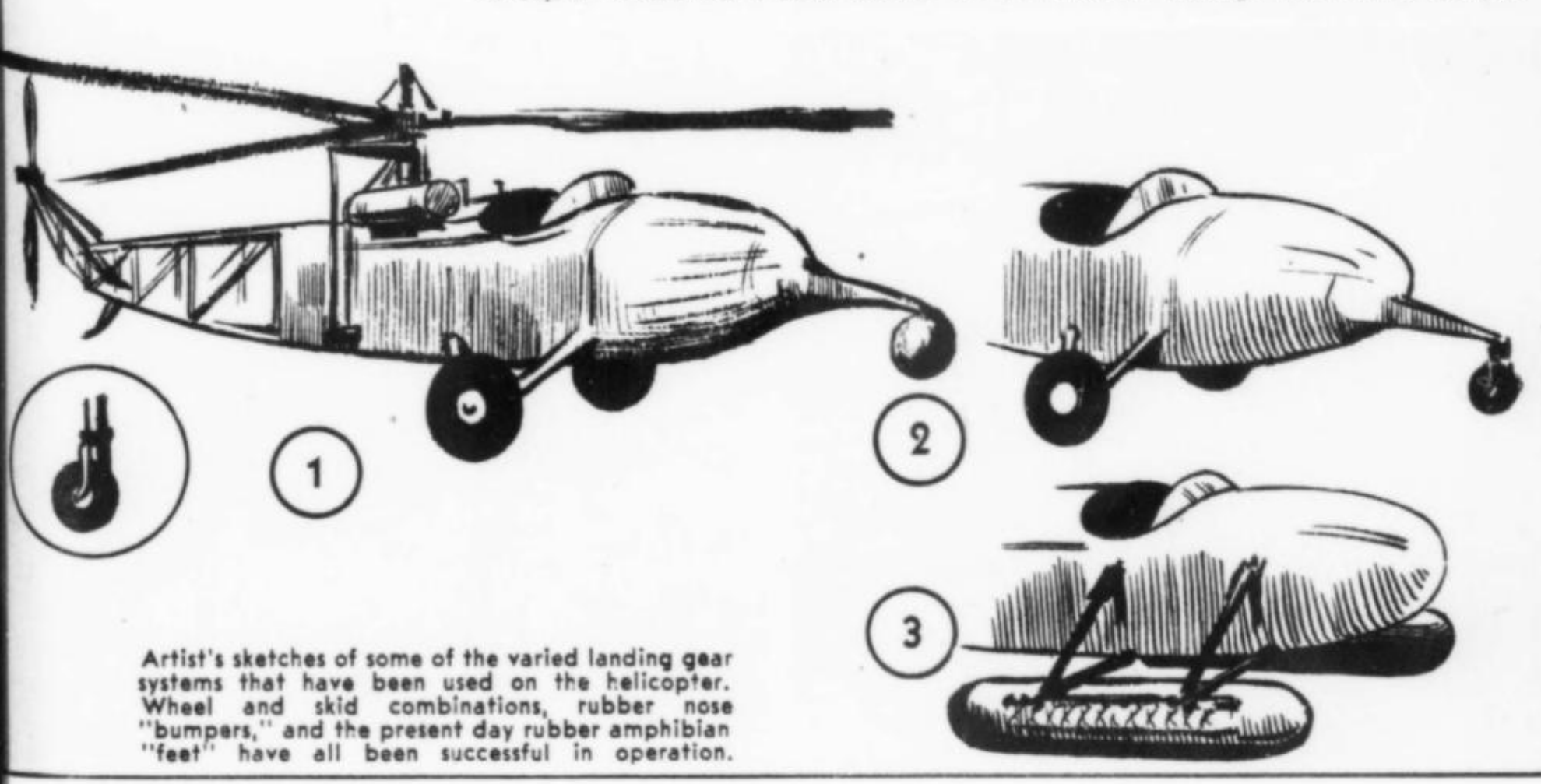
Continued

YOU CAN FLY MY HELICOPTER

While the pilot beside him leisurely holds the ship stationary in midair, passenger of Army-Sikorsky helicopter opens door and receives package from girl on ground.



Chief Pilot Charles L. Morris prepares for a hop in the daddy of heli-flivvers. He holds helicopter license No. 2 Rotor control rod is visible on fuselage side behind cockpit.



Artist's sketches of some of the varied landing gear systems that have been used on the helicopter. Wheel and skid combinations, rubber nose "bumpers," and the present day rubber amphibian "feet" have all been successful in operation.

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OCTOBER, 1947 — VOL. XXXVIII, No. 6

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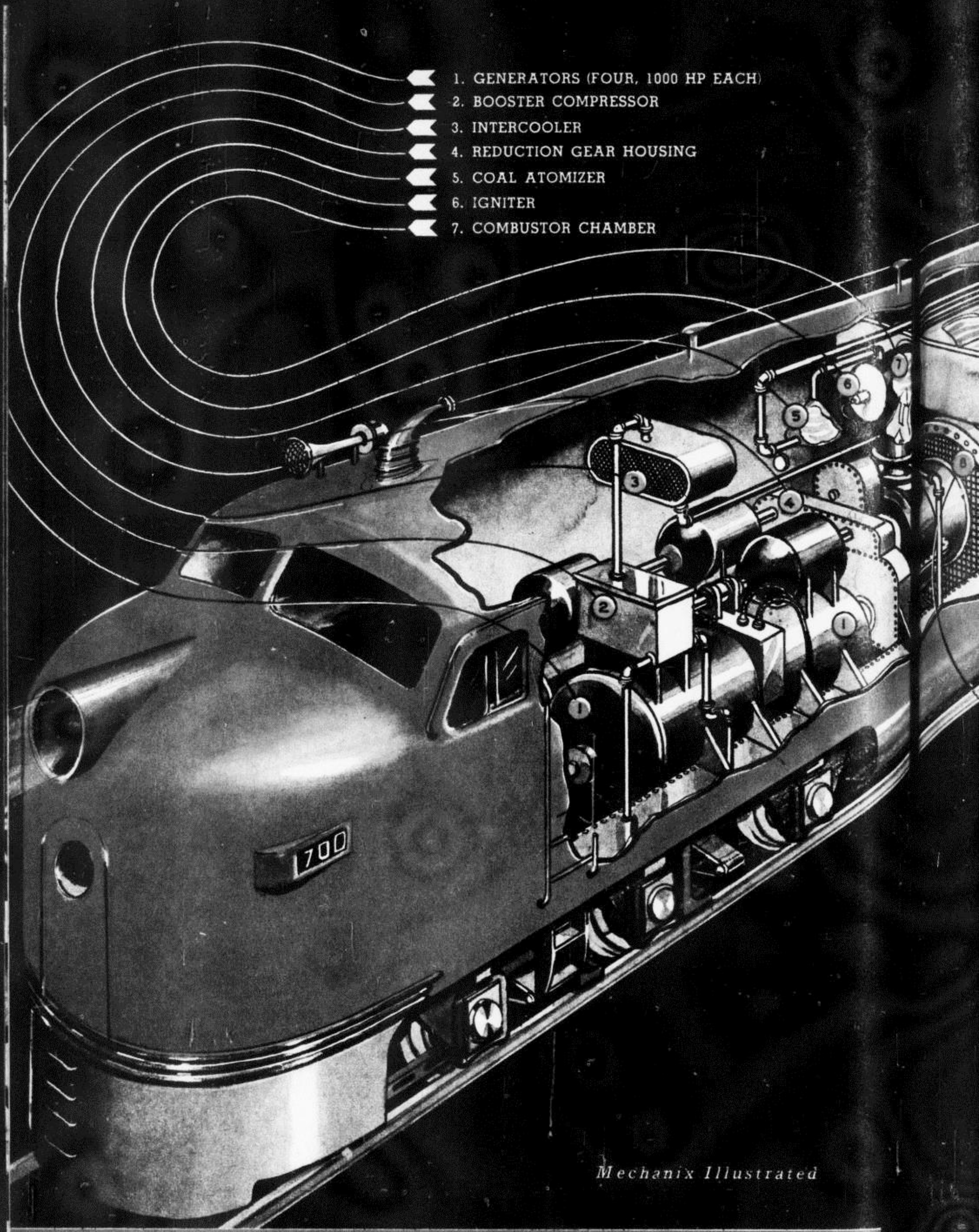

Mechanix Illustrated

Powdered Food for the Iron Horse

BY WILLIAM WINTER

Artist's conception of gas turbine being built by American Locomotive.

8. SCREENED AIR INTAKE
9. 21-STAGE AXIAL-FLOW COMPRESSOR
10. REGENERATOR
11. 6-STAGE REACTION TURBINE
12. FLY-ASH SEPARATOR
13. FLY-ASH STORAGE
14. COAL PICK-UP
15. COAL PUMPS
16. COAL CRUSHER

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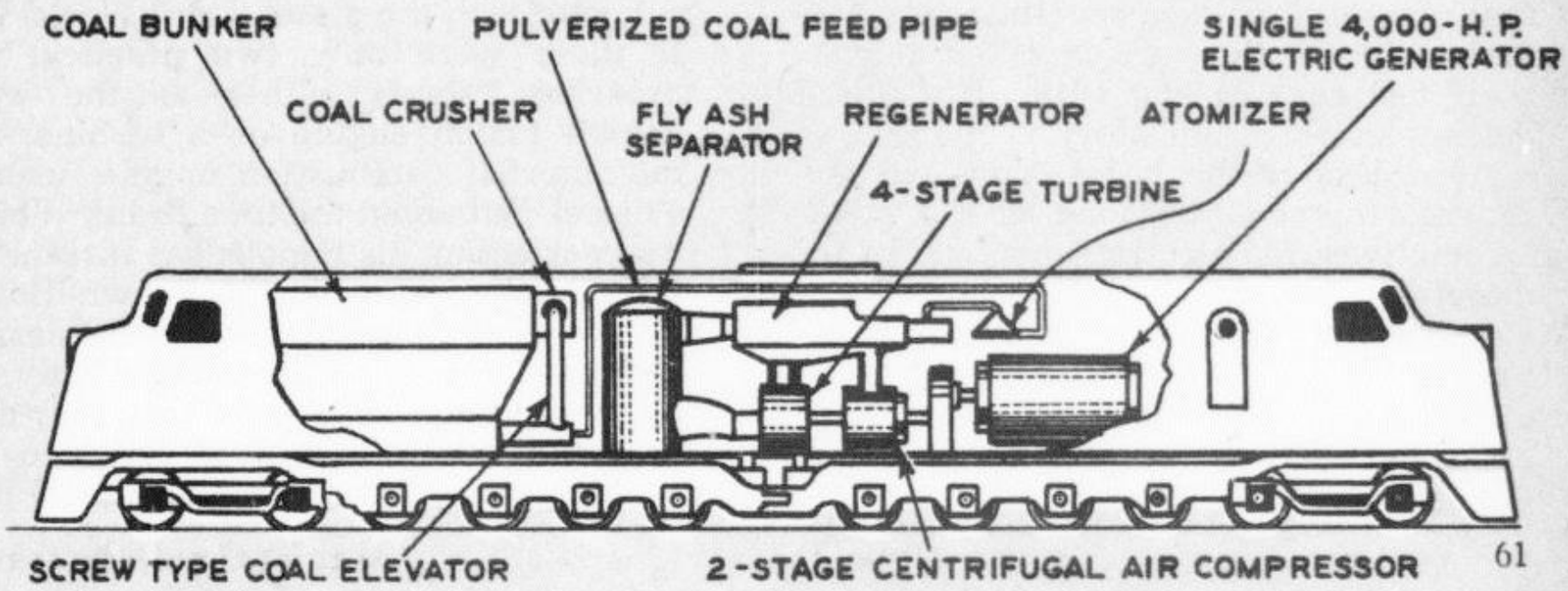

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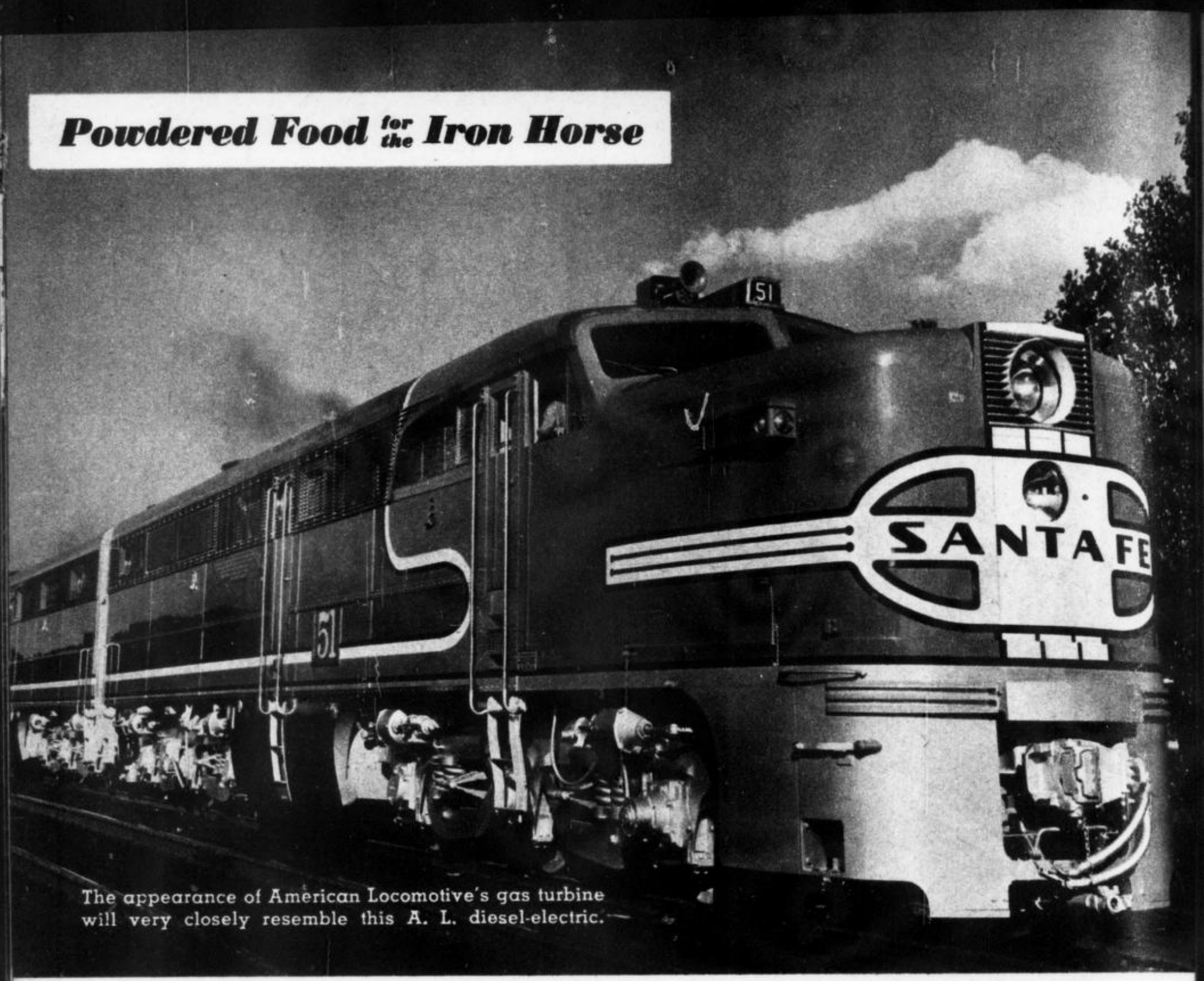
SECTIONAL VIEW OF BALDWIN CENTRIFUGAL FLOW GAS TURBINE LOCOMOTIVE

Powdered Food for the Iron Horse

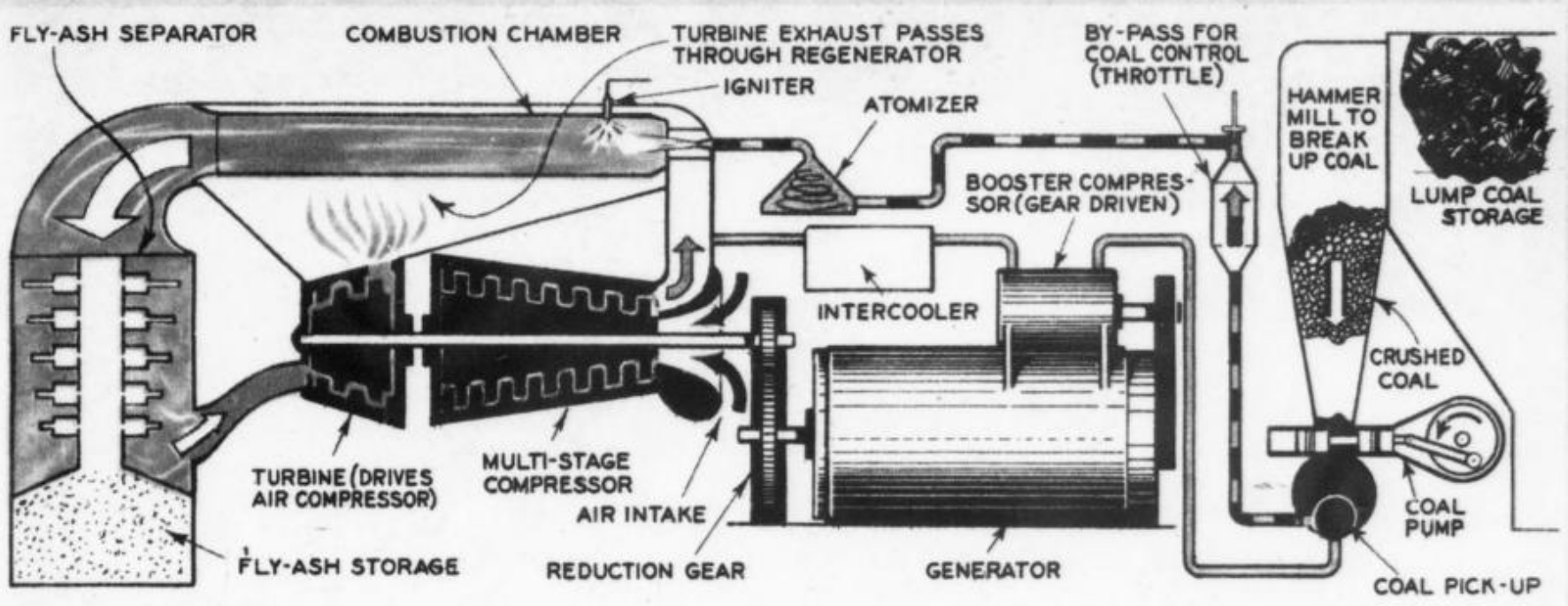


The appearance of American Locomotive's gas turbine will very closely resemble this A. L. diesel-electric.

ONE day in the fall of 1945 the presidents of the six major coal-burning eastern railroads held a historical meeting. Present were officials of three of the country's largest coal producers and officials of Bituminous Coal Research, Inc. Something was bothering these gentlemen. That something was diesels. Now, as a direct result of that meeting two new revolutionary gas-turbine locomotives are expected to make their test runs during 1948. But this is getting ahead of our story.

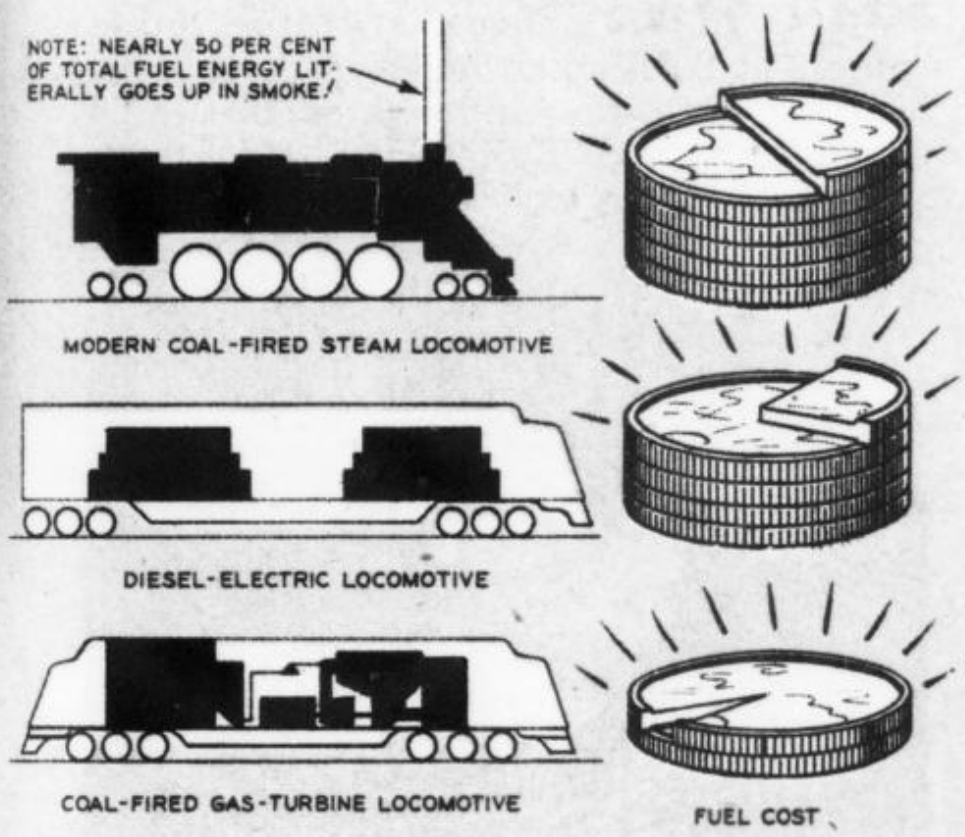
According to the latest "cow-catcher" census, this country had 38,425 steam locomotives, 745 electric, and 2,991 of the diesel-electric engines which now dominate new orders for road locomotives. Although diesel fuel costs three times as much as coal in terms of heat units, the greater efficiency of the diesel locomotive (27 percent as compared with a lowly 7 percent for steam) makes it about 20 percent cheaper to operate, as far as fuel cost is concerned. Now, coal is the traditional fuel of the eastern roads. Steam locomotives consume one-fifth of all the coal mined in the United States, and the biggest coal-using roads are also the biggest coal carriers. But the iron horse snorts up to 50 percent of its heat energy through the stack.

At that meeting of "biggies" it was decided to form a Locomotive Development Committee of Bituminous Coal Research, Inc., to seek ways and means of developing a coal-burning locomotive that could compete with the diesel. Until World War II there were only two practical approaches: steam, either as the well-known piston engine or a turbine, and the internal combustion engine, usually a diesel. But about the time Frank Whittle was perfecting his famous gas turbine for jet-propelled aircraft, the Brown-Boveri company of Switzerland was harnessing the gas turbine to a locomotive, only, instead of giving it a jet for thrust, they connected it via an electric drive to the wheels. Studies revealed that the 20 per-



HOW IT WORKS: — SIMPLIFIED FLOW DIAGRAM OF TYPICAL COAL-FIRED GAS TURBINE ASSEMBLY.

LEGEND: — PRESSURIZED AIR — AIR AND COAL — COMBUSTED GASES



COMPARATIVE COSTS IN DOLLARS PER EACH 1,000 HORSEPOWER HOUR

Above, simplified flow diagram of a typical coal-fired gas turbine assembly, and left, a graphic illustration of the fuel economy it makes possible. Below, high-speed photo of the atomizing action of Westinghouse's radical new "fuel atomizer" beside one of conventional type. It blasts thick fuel oil into ultra-fine droplets, allowing conversion of as much as 96 per cent of the potential heat energy of the oil.

cent efficient gas-turbine locomotive, because of the low cost of coal in terms of heat units, could be operated for considerably less expense than the diesel. Where as the diesel costs $4.26 per 1,000-hp-hours to operate, the coal-burning gas turbine can be run for $1.91. Lubricating costs are virtually eliminated. A diesel's lubricating oil bill is 10 to 20 percent of its fuel costs, but the gas turbine will get by for a year on a tank of oil. On the basis of a quarter-million miles a year, such a locomotive will realize a saving of $40,000 in fuel and maintenance.

If these experimental engines prove out, the diesel is in for a real fight. Moreover, at least one road, the Sante Fe, is developing a [*Continued on page* 175]

CONTROL ROOM OF PILOT HOUSE

LEGS OF "A" FRAME

BOARDING LADDER

WINCHES

BOOM LIF
10-TON W

AFT N
RAISED
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DRIFTW
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FILLED

STARBOARD HULL'S PROPELLING DIESEL ENGINE

CUTAWAY OF MAIN DECK SHOWING CONTINUITY OF TWIN HULLS AND FLOW OF WATER BETWEEN THEM

WINGS FO
IN HOISTI

SCOUT

DRIFTWOOD

SHEAVES CONTROL RAISING AND LOWERING OF NETS THROUGH HYDRAULIC SYSTEM

PR
MA

ENGINEERS' SPEEDBOAT TOURS NEW YORK HARBOR IN DAILY SEARCH OF DRIFTWOOD PACKS

100 FT.
100 FT
100 FT.

P TO 1,000,000 CU. FT.
F DRIFTWOOD HAVE BEEN
OLLECTED IN ONE YEAR

L.O.Reavis

STEEL BARGE

DEBRIS UNLOADED ON NEARBY ANCHORED BARGES IS CONTINUOUSLY BURNING

CONCRETE BARGE

Mechanix Illustrated

AIR SPACES PREVENT OVERHEATING OF BARGE

Driftwood Pickup

Army engineers have contrived a twin-hulled vessel that ploughs right into harbor driftwood and carries it away.

October, 1947

Turn page . . . . . .

Present equipment. Here, collecting vessel by the barge it has filled. Below, men assembling driftwood within the towed net.

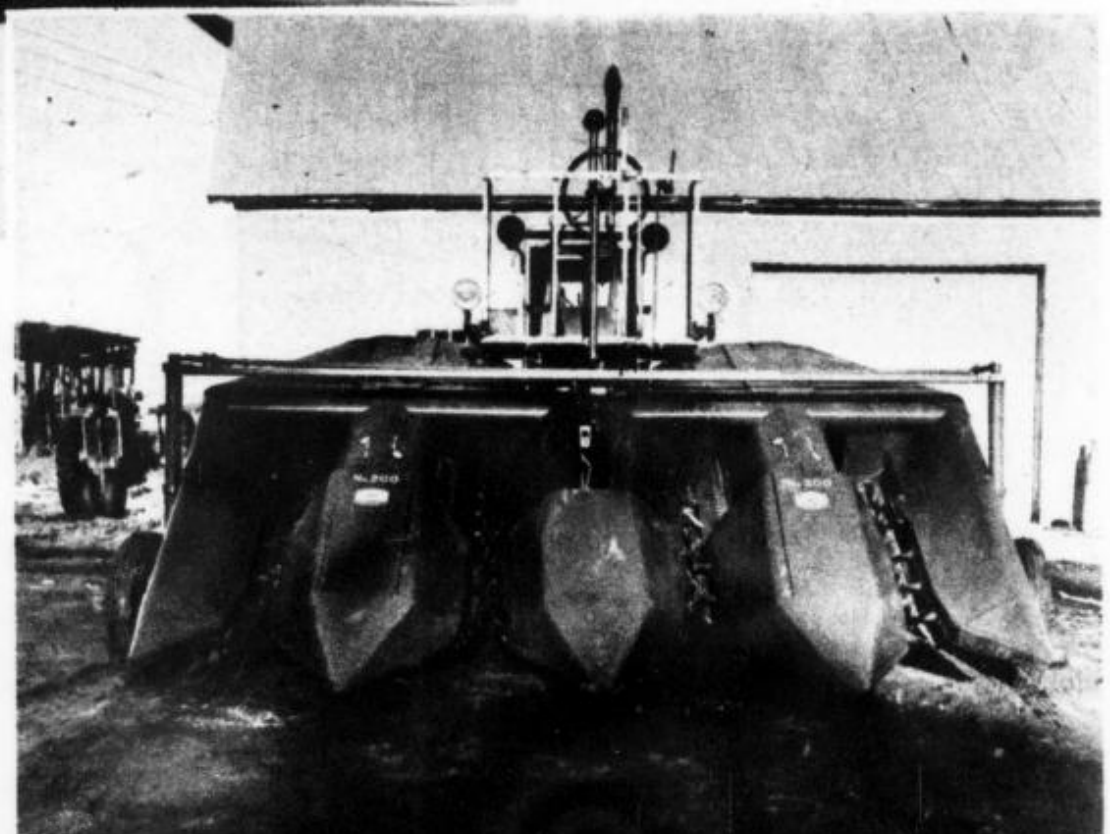
Driftwood Pickup

UNCLE SAM'S Army engineers have devised a floating "hyacinth machine" and a "snag remover" to eradicate persistent evils in inland waters and now, facing the increasing menace of driftwood in New York's harbor, they have contrived another marine contraption which, like a steam shovel's bucket, ploughs right into its objective and carries it away.

The operation is beautifully simple. Utilizing the twin-hulled principle of the catamaran, the new "self-propelled driftwood collector"—for whose construction bids have recently been asked—will have two walled-in wells, forward between the hulls, in which strong steel [*Continued on page* 179]

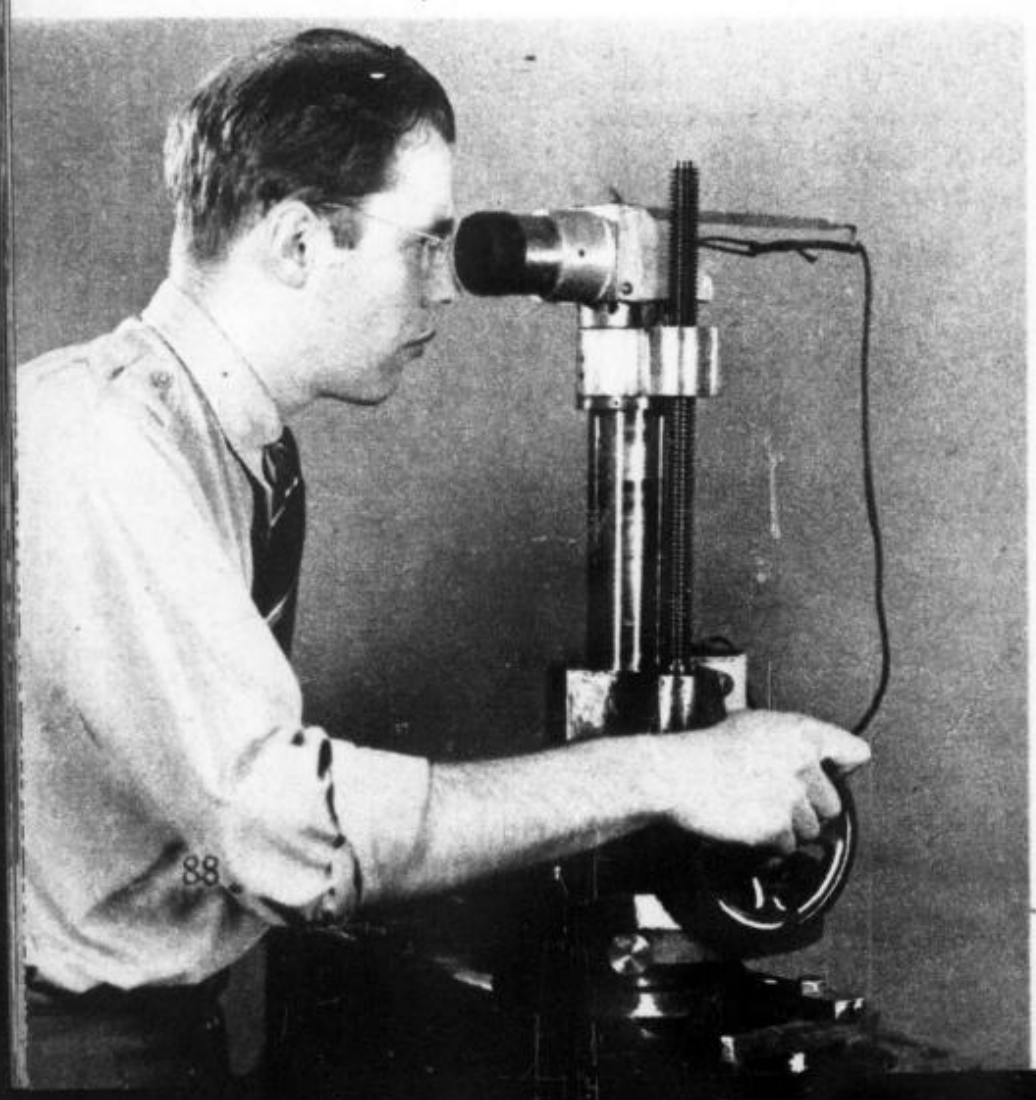
Science in PICTURES

6-Wheel Bus bends and twists in the middle and turns even sharper than conventional buses. Front and rear wheels turn in concert so that rear wheels track the front ones. The swivel-hip effect is accomplished by "rubber-in-twist" springs developed by Goodrich.



Corn Picker at right picks four rows of corn at once and is self-propelling. Arthur Abel, of Fairmont, Minn., made it by hooking two pickers together abreast. He sold the patent rights to the John Deere Company. The unit pulls a wagon to catch the husked corn.

Contour Gauge below measures the radial distance from the axis of an engine cylinder to the cylinder wall. Heretofore, instruments have measured diameter. This one shows the actual shape.



Tubeless Tire is pierced by nails but does not leak. It combines features of puncture-sealing tubes with new casing construction. Air pressure on the bead prevents escape of air around rim.

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NEW GADGETS FOR MORE FISH

SEE PAGE 72

volume 41 number 1

mechanix illustrated

may 1949

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Cover photo by Grayson Tewksbury

Gadgets courtesy Abercrombie and Fitch Co.

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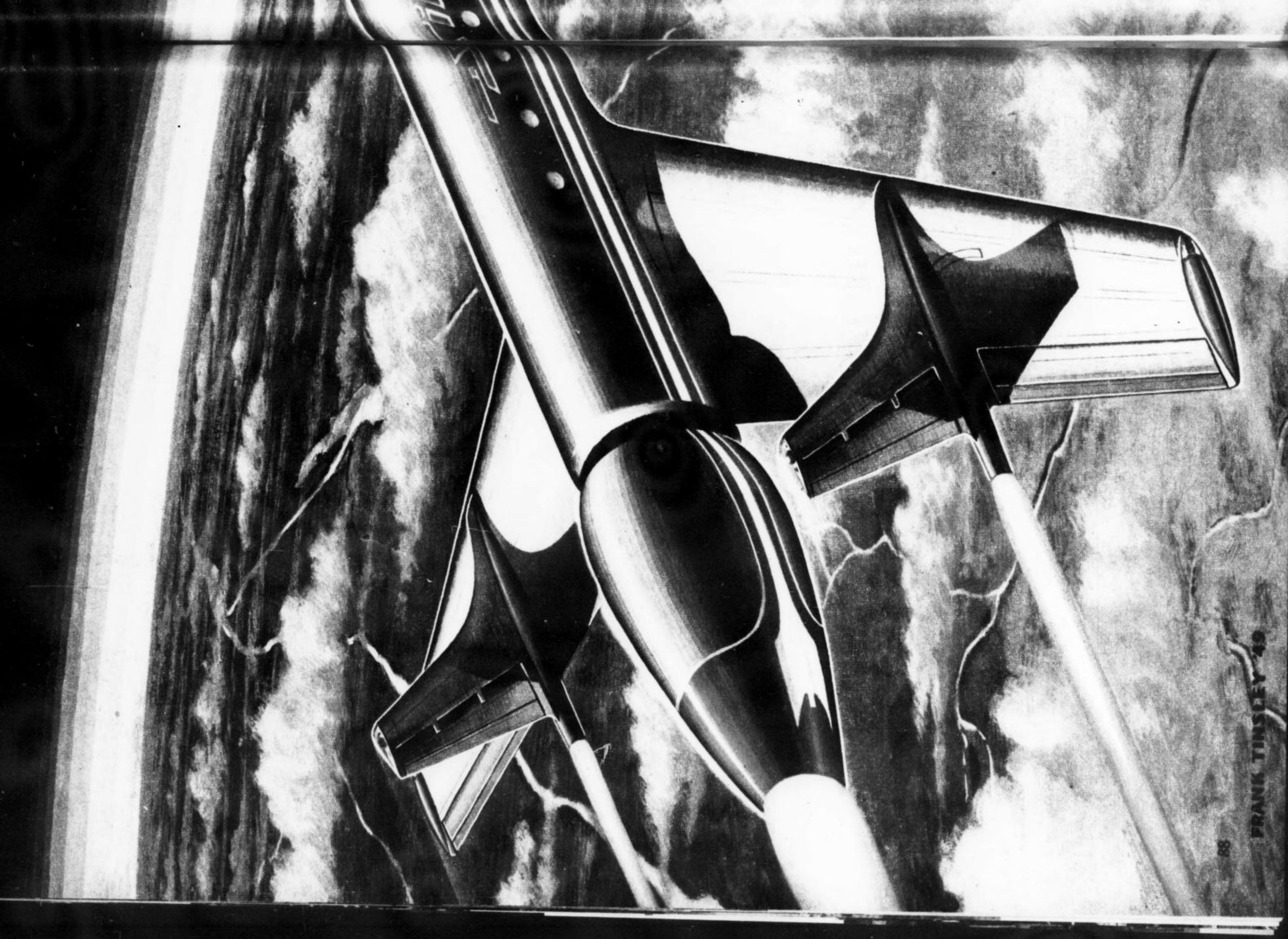

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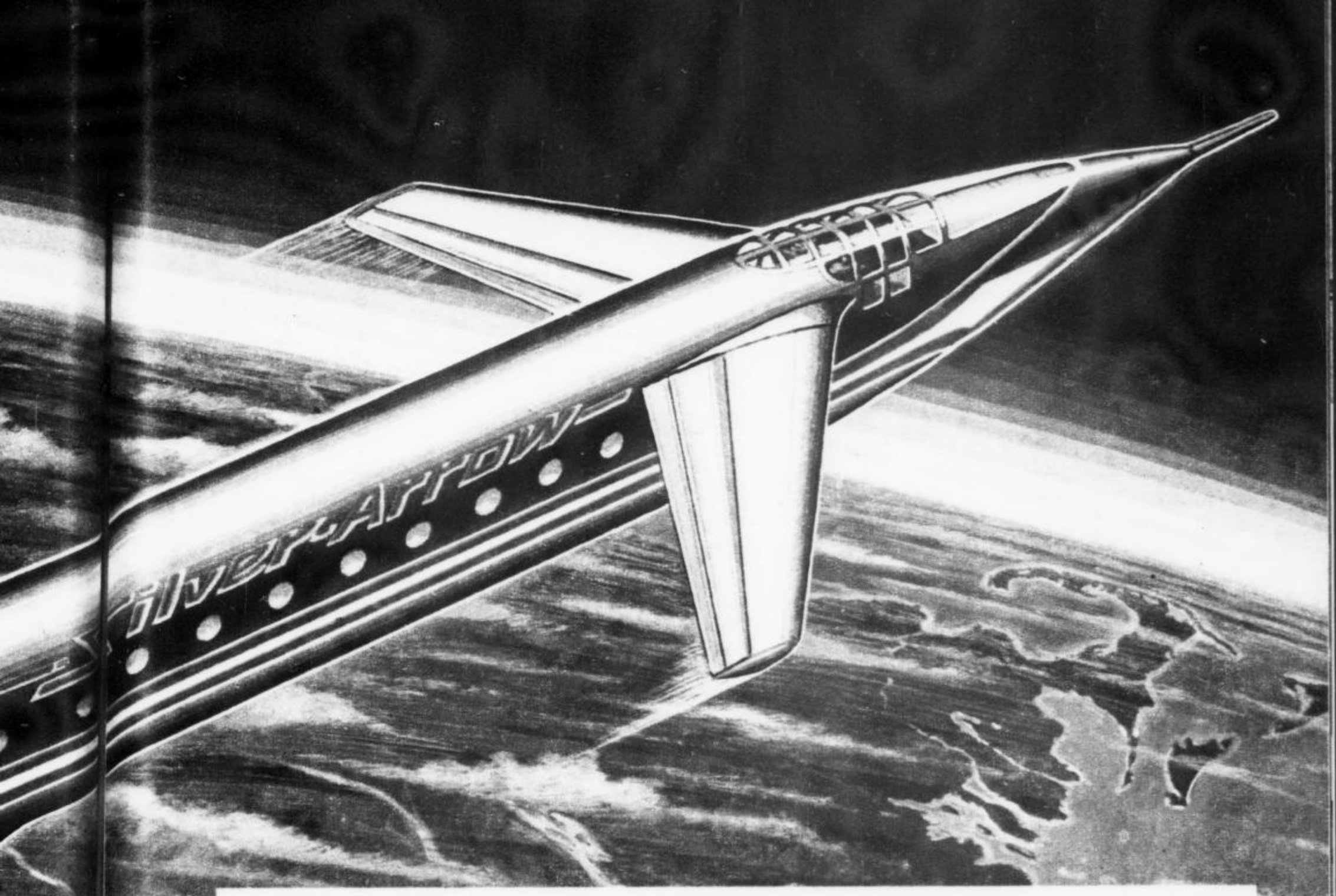
FRANK TINSLEY '43



New York to California in MINUS 3 Hours

World's first Atomic Airliner, previewed here by MI from plans under way for nuclear craft, may fly "forever" at 10,000 mph.

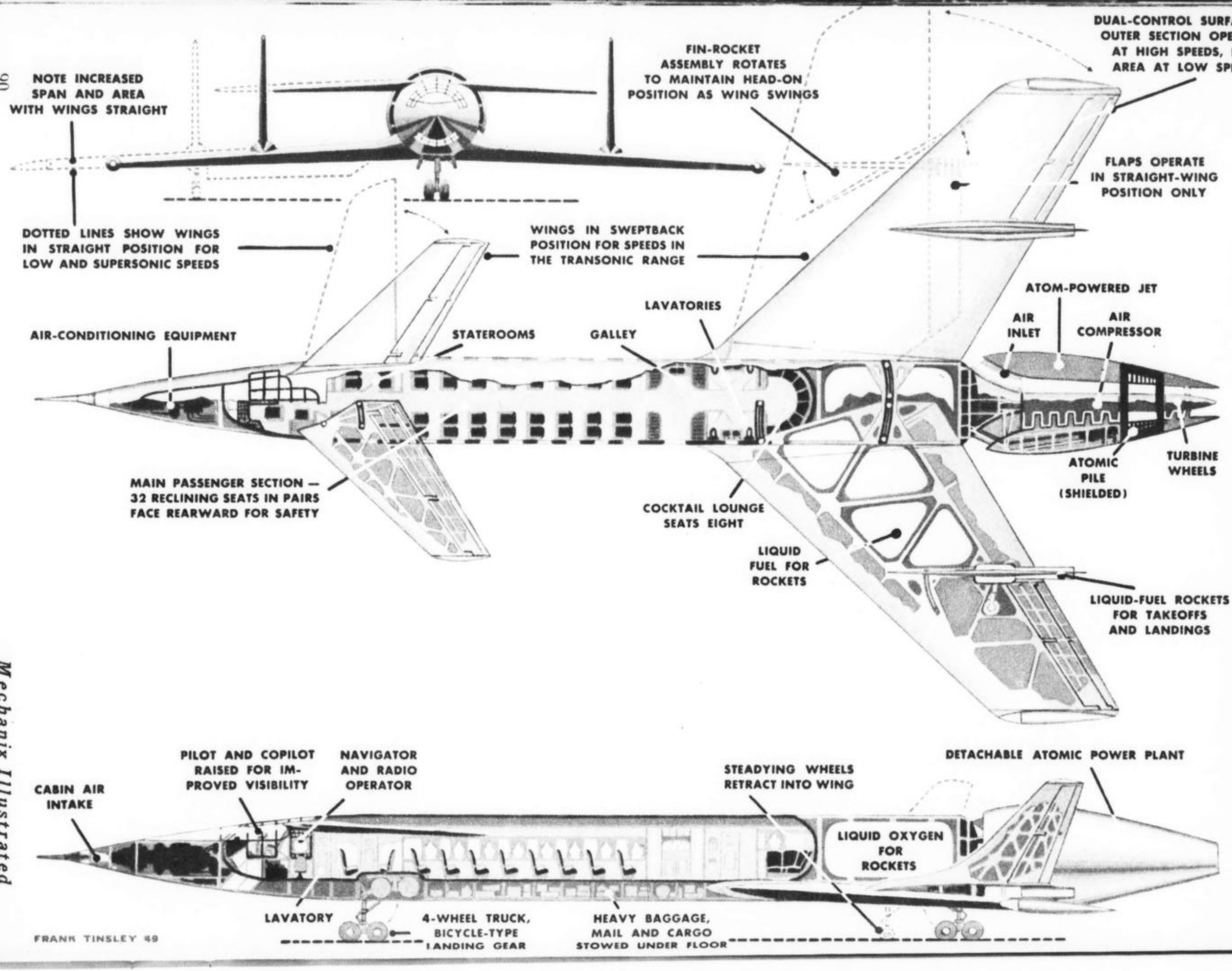
By Frank Tinsley

TOMORROW'S Atomic Airliner will easily shatter the 5000 mph-speed record for today's two-stage rocket, the "Wac Corporal." The liner could take off from New York at noon and flash into Los Angeles at 9 a. m. the same day—*three hours before it started!*

By flashing through time zones from Eastern Daylight to Pacific Standard, the Atomic Airliner would have no trouble gaining three hours on the clock. That would include 40 minutes for a relatively slow climb to, and descent from, high altitude and a shade more than 15 minutes for actual cruising time at 10,000 mph.

But even this terrific speed would not be the absolute maximum for the atom-powered plane. Such a craft might fly 12,000, 15,000, 18,000 mph—or even [*Continued on page* 91]

SPECIFICATIONS FOR 10,000-MILE-AN-HOUR ATOMIC AIRLINER



faster. Despite the subzero cold at 60,000 feet, where normally the super airliner will fly, a new refrigerating system for planes will be needed to keep friction with the rarefied air from melting the hull as the ship streaks through the stratosphere. With an atomic engine, top speed would be limited only by the practical considerations of the plane's structural strength and the airline's flight schedules.

Not only will the Atomic Airliner have virtually no top speed but, theoretically at least, it will have unlimited range. Recently an Air Force B-50, Lucky Lady II, made a sensational nonstop flight around the world. Though Lucky Lady flew more than 23,000 miles before coming down to earth again at Fort Worth, Texas, 94 hours after takeoff, the globe-girdling bomber had to be refueled four times in the air by special B-29 tankers to make that distance. Once aloft, the Atomic Airliner would never run low on fuel and could streak around the world in some two hours—then just keep on flying practically forever, or until its crew literally dropped dead of old age.

Study of the latest reports available from the nuclear-fission experimental labs indicates that the atom-powered plane with such fantastic speed and unlimited range has flown out of the dream world and is actually in sight. According to David M. Poole, an Oak Ridge scientist, the atom aircraft is already beyond the theoretical stage and it's now up to the engineers to draft specifications and build working models.

"The time has come," Mr. Poole says, "when we can no longer afford *not* to have atomic aircraft."

To give MI's readers an exclusive preview of this revolutionary new plane, the author has studied the latest information available from the nuclear scientists and drawn on his own knowledge of advanced air design to picture on these pages the world's first Atomic Airliner.

Undoubtedly, the first nuclear aircraft will be military. The speed potential and unlimited range of atomic power makes it a logical vehicle for the delivery of its deadly sister, the atomic bomb. Then, after Air Force pioneering has eliminated the inevitable bugs, next will come a limited number of official atom-powered transports, followed in short order by the first Atomic Airliner. We use the word "limited" advisedly because of the enormous cost of the atomic fuel and reactor and because its very efficiency will place a cast-iron limit on the number of machines required to handle the traffic. Until some new, basic discovery lowers atomic-power costs drastically, the airliner will be used primarily for super-speed, emergency service—at super-high rates.

Size and seating capacity of MI's atom express will depend on the weight of the shielding necessary to protect the plane's crew and passengers from the powerplant's deadly radiation. Most estimates now put the gross weight of the projected atomic aircraft at 70 tons—about the same size as the B-36 bomber. If current experiments with lighter shields prove successful, though, our new plane may weigh no more than the B-47, Boeing's 62-ton jet bomber.

On the basis of completed research, Dr. Andrew Kalitinsky, head man of the Nuclear Energy for Propulsion of Aircraft project at Fairchild Laboratories, New York, says that the atomic engine, the reactor and the shielding for the plane will weigh about the same as the engines, fuel load and tanks of our present big planes—and therefore will call for a large airframe.

The design of the airframe must be adapted to the particular type powerplant developed for the plane. In a recent progress report, Dr. Kalitinsky includes steam turbines, turbo-jets, ram-jets and hydrogen rockets in his outline of the basic forms of powerplant for utilizing atomic energy in aircraft. The most practical of these engines at present, the atom-powered turbo-jet, is used in the design of MI's Atomic Airliner. A nuclear reactor girdling the combustion chamber like a belt will take the place of conventional fuel and heat the air "fuel" for the jet.

The big problem in designing an atom-propelled plane is just how to seal off the "hot" rays radiating from the atomic pile. Even a giant plane could never lift massive, concrete shields like those surrounding the stationary piles at Hanford, Oak Ridge and Brookhaven.

Intensive research now under way may soon solve this shielding problem. The most lethal radiations are the neutrons and gamma rays. Layers of a material such as graphite can reflect the neutrons without any absorption. On the other hand, only a dense material like lead can slow up or absorb gamma rays.

"A material that is good for stopping gamma rays," says Dr. Kalitinsky, "may not be the best when gamma rays and neutrons are considered together. And a material that is good for the innermost part of the shield may not be the best for the outer layers. Consequently, there is considerable room for weight reduction by ingenious design." [*Continued on page* 161]

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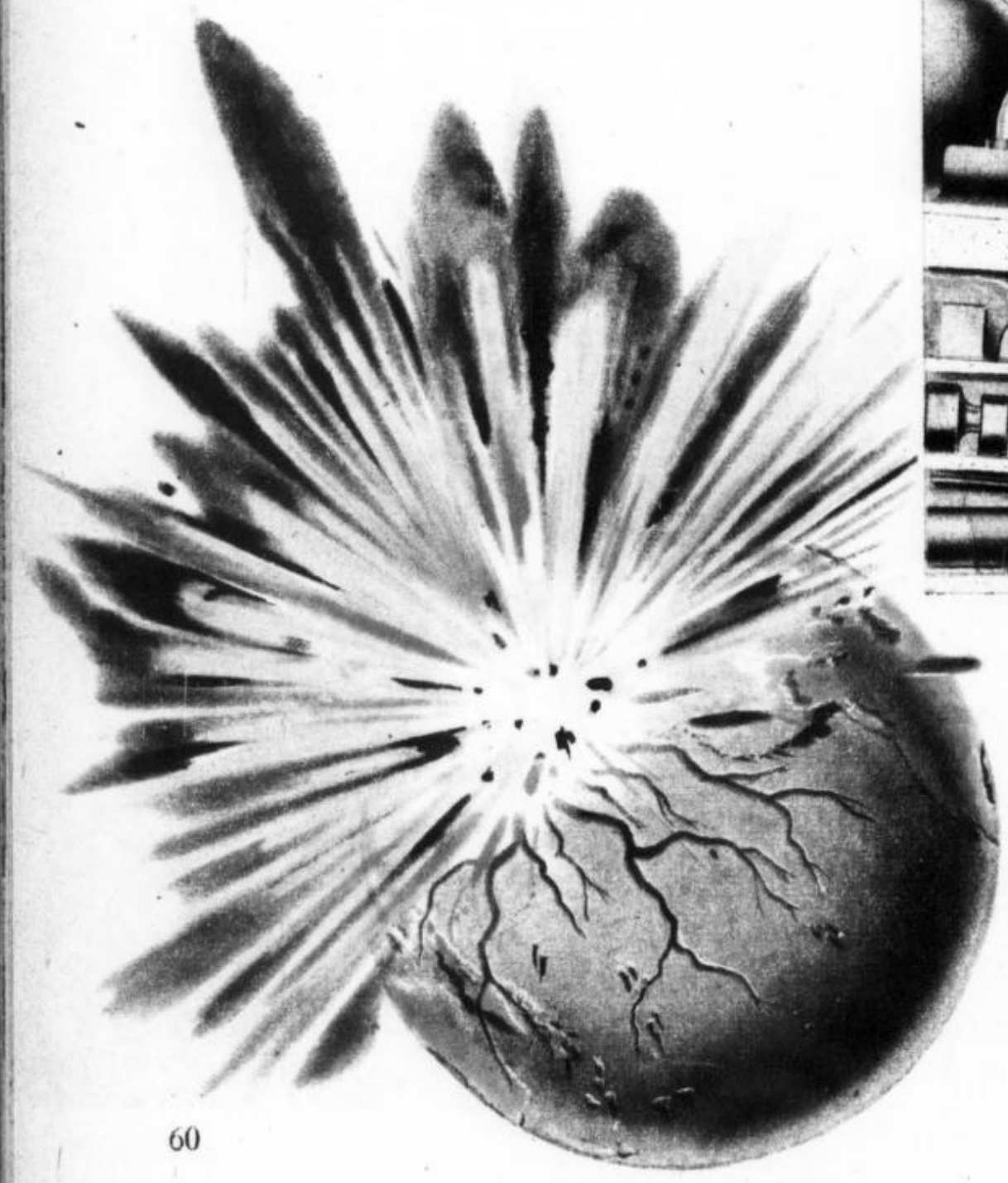
Deadlier than the atom bomb

BY WILLY LEY

Does the United States possess a weapon "far more formidable than the atomic bomb?" Is it a lithium bomb? The "lithium reaction" is known to power some of the stars.

It would not save us to build our cities underground; an atomic bomb, exploded on the surface, would destroy them utterly (right). A lithium bomb might be much worse. An uncontrolled chain reaction would blow up the whole earth!



FOR some time now there has been much speculation whether the United States possesses an even more destructive weapon than the atomic bomb and, if so, what it could possibly be. It all started with a remark made by a Congressman about a "weapon far more formidable than the atomic bomb itself," followed by the apologetic state-

ment "I guess I have said too much."

What did he have in mind when he made that remark?

One newspaper commentator said that the weapon was based on cosmic rays, which does not mean much in itself since cosmic rays are simply rays of a very high power of penetration. Some observers guessed at biological or germ warfare. The remainder of the observers were divided into two camps of very unequal size and strength. A few suspected that the whole incident was purely political in nature and not backed by anything tangible. Most decided that a new development in atomic weapons was behind all this.

There are several possible developments in atomic weapons, though it is doubtful if any has reached a finished state in light of the assertions of the top men in the atomic field, that vir-

The AAF B-36, largest bomber in the world, could carry a lithium bomb.

tually no progress has been made since Hiroshima, mostly because of the unanimous opposition of everybody concerned against General Groves.

The possible developments are these:

1. A different method of using the existing kind of atomic bomb.
2. So-called "radioactive poisons."
3. A super-bomb based on what is known as the lithium reaction.

A different method of application of the existing type of atomic bomb would be merely to let them explode on the ground. So far atomic bombs used over land have been exploded in midair, acting through an enormous heat blast, followed by a pressure wave and accompanied by flood of deadly radiations. But if such a bomb were set off on the ground results would be quite different. The heat blast and the radiations would be more restricted in their actions (which means less effective), but the explosion itself would set off earthquakes which may or may not do appreciable damage.

Anatol J. Schneiderov finds that the energy liberated in an earthquake is of the order of 1.5×10^{24} ergs. It seems obvious that the energy needed to "trigger" an earthquake would have to be of about the same magnitude. That energy is not beyond human means. The explosion of a Hiroshima bomb would release more than four times the needed amount. It is easy to see that such a bomb, exploded on the ground, might trigger an earthquake in a crust under strain.

The second possibility has been recognized all along. The famous Smyth report stated, "The fragments resulting from fission are in most cases unstable nuclei, that is, artificially radioactive materials. It is common knowledge that the radiations from radioactive materials have deadly effects akin to the effects of X-rays. In a chain-reacting pile these radioactive fission products build up as the reaction proceeds. They have, in practice, turned out to be the most troublesome feature of the reacting pile."

In December, 1941, Prof. Smyth wrote a report about this problem in which he stated that the artificially radioactive substances produced during a single day's run of a single pile would make a very large area uninhabitable; that these substances would have all the characteristics of an especially vicious poison gas; and that use of them was not advocated by anybody in this country: "but serious consideration was given to the possibility that the Germans might make surprise use of radioactive poisons and accordingly defensive measures were planned."

There is, of course, a big difference whether an atomic airburst wipes out an area with after-effects lasting two weeks, or whether an area is rendered literally deadly for many years by radioactive dust, which may go into any chemical

combination you can think of (be oxidized by burning, digested with food, changed into salts by acid, and so on) *but which will remain radioactive and deadly in any of these chemical combinations!*

The third possibility, finally, is an atomic super-bomb, and many people have cast frightened glances at the so-called lithium reaction which is known to power some of the stars. The explosion (i.e., energy release) of the plutonium bomb is accomplished by the breakdown (fission) of very large atoms. But you can get atomic energy also from the combination of lighter atoms, and the reaction which has been best explored in theory as well as with some experimentation is the combination of one atom of lithium with one atom of hydrogen. Together they form two atoms of helium, with a frightening amount of energy left over, i. e., released. One gram of lithium and hydrogen, uniting into helium, will release 2.2 x 10^{18} ergs—and both lithium and hydrogen are much cheaper and more abundant than uranium.

There is only one practical difficulty: to bring this reaction about you need heat, and the faster you want the reaction, the more heat you need. At the temperature of the core of our sun, estimated at 20 million degrees centigrade, lithium and hydrogen would combine into helium within a few seconds in an ultra-violent explosion. (We are sure that our sun is not powered by that particular reaction—it is too hot!—but by another one which needs even more heat.) Now, there has been no way to achieve temperatures of 20 million degrees or more, so the knowledge of the lithium reaction was apparently an especially useless bit of "pure" knowledge. But the temperatures of an exploding plutonium bomb must be in those regions where the lithium-hydrogen reaction takes place, and takes place *fast*.

The plutonium, in such a bomb, would act very much like the booster charge in an ordinary bomb. But since the plutonium booster has to be rather big in itself in order to work at all (say, about the size of the Hiroshima bomb) the lithium bomb would have to be several times as large.

We can be fairly sure that, at the present moment, no such lithium bomb exists—but we must also be ready to accept the possibility that it can exist and will.

The A-bomb's deadly radiation cannot be stopped by a gas mask.

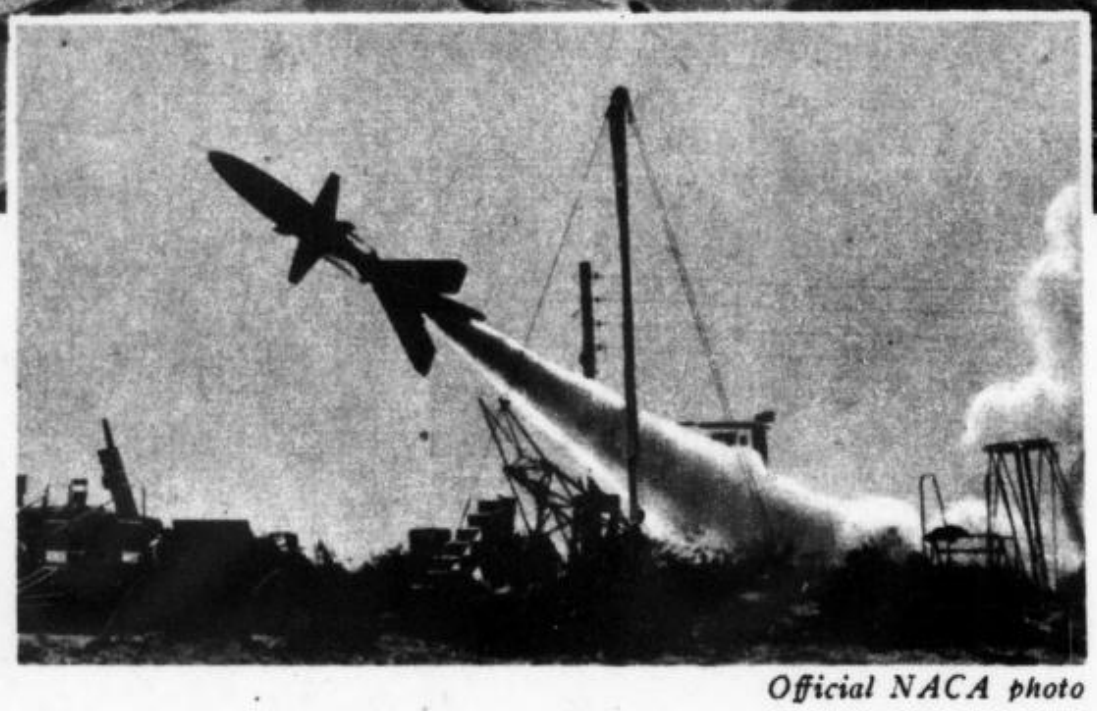
Station MOON

Radio rocket planned by Army would send hourly signals from the Moon.

STATION MOON may soon be calling Earth. The U. S. Army is constructing a Moon-bound radio-carrying rocket which it expects to complete early in 1948.

The missile will weigh only 100 lbs., including a 50-lb. radio capable of transmitting its signals across the intervening quarter-million miles of space.

At its calculated speed of 4,000 mph, it should reach the Moon in 60 hours. A time device will turn on the radio for one minute of broadcasting every hour, both during the journey and for several days after landing. A proximity fuse will detect the nearness of the Moon, cut off the forward rockets and turn on reverse ones, providing an easy landing.



Official NACA photo

Moon rocket builders are studying closely NACA'S missile shown being test-fired above. Two tails carry separate power plants—when its fuel is exhausted, the rear tail drops off.

Helicopter Pickaback

Shipwreck far at sea will lose its terrors when this air-rescue plan goes into effect.

BY ROLAND CUEVA

TWELVE tired, oil-soaked men squatted miserably on a liferaft. Their eyes, constantly straining skyward, held a glint of desperation that belied the hopeful chatter of their mouths. Though it was less than three hours since they had dragged themselves from floating wreckage to the comparative safety of the raft, a dark sediment of fear had sifted down on them like coal dust through the bright sunshine.

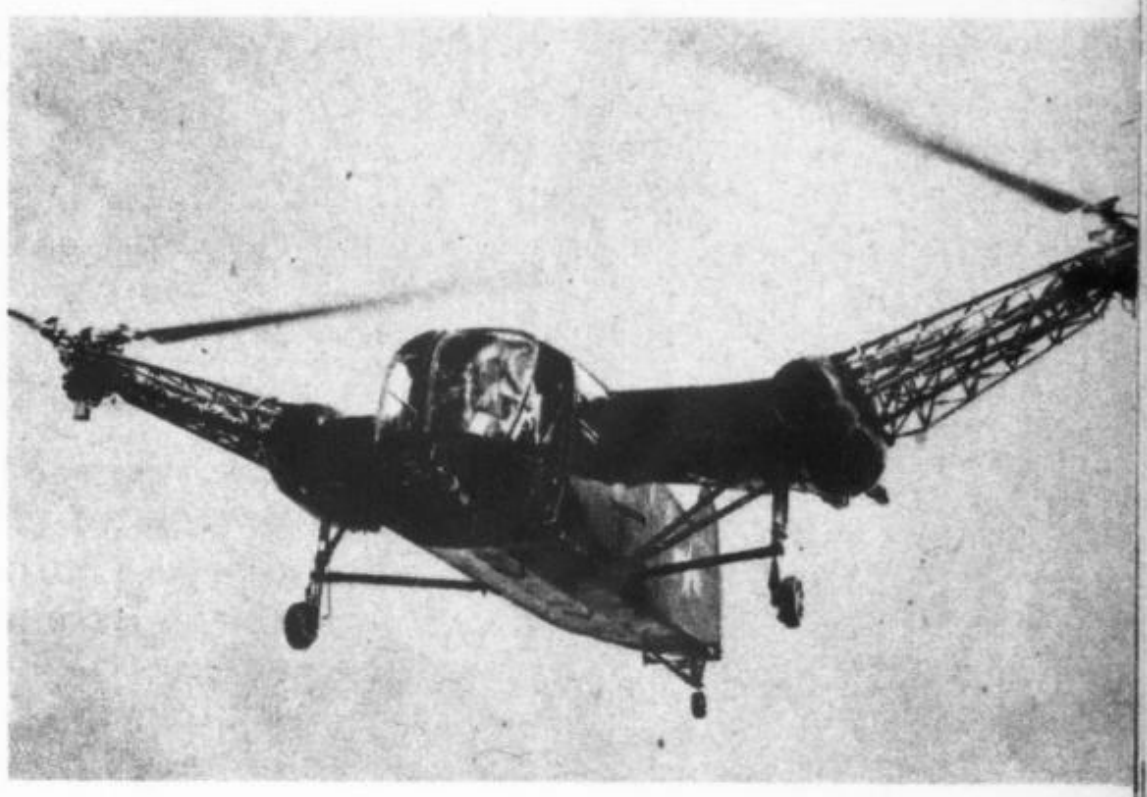
Then suddenly the airplane was overhead; a huge airplane, resembling a flying wing, with what looked like two windmills clinging to its back. The men stood up in their excitement—two fell overboard and for a minute the plane was forgotten in the wild scramble to haul them back aboard.

When they looked up again, the windmills had detached themselves and were floating straight down toward the raft, while the mother plane circled slowly. Twenty minutes later all 12 castaways were winging their way to safety, wrapped snugly in warm blankets and sipping hot coffee in a lounge nearly as large as a hotel lobby.

This incident hasn't actually taken place—as yet, but when it does it will be the end product of a chain of events that started on the cold gray afternoon of January 3, 1944.

About 3:30 p.m. that day, a wingless aircraft, with whirling vanes slicing the snowy air above it, took off vertically from Manhattan Island and descended 14 minutes later on a whitened beach in front of the Sandy Hook Coast Guard Station. Its pilot was 36-year-old Commander Frank A. Erickson, chief of Floyd Bennett Field's Coast Guard Aviation Unit, and his cargo consisted of two cases of blood plasma. Commander Erickson was not out for a joy ride that gloomy winter day; he was pioneering helicopter rescue work, and the lives of the survivors of a destroyer explosion depended on their getting the plasma not in an hour or so, as delivery by boat would have taken, but in a matter of minutes.

The daring mission started a long period of experimentation using helicopters for



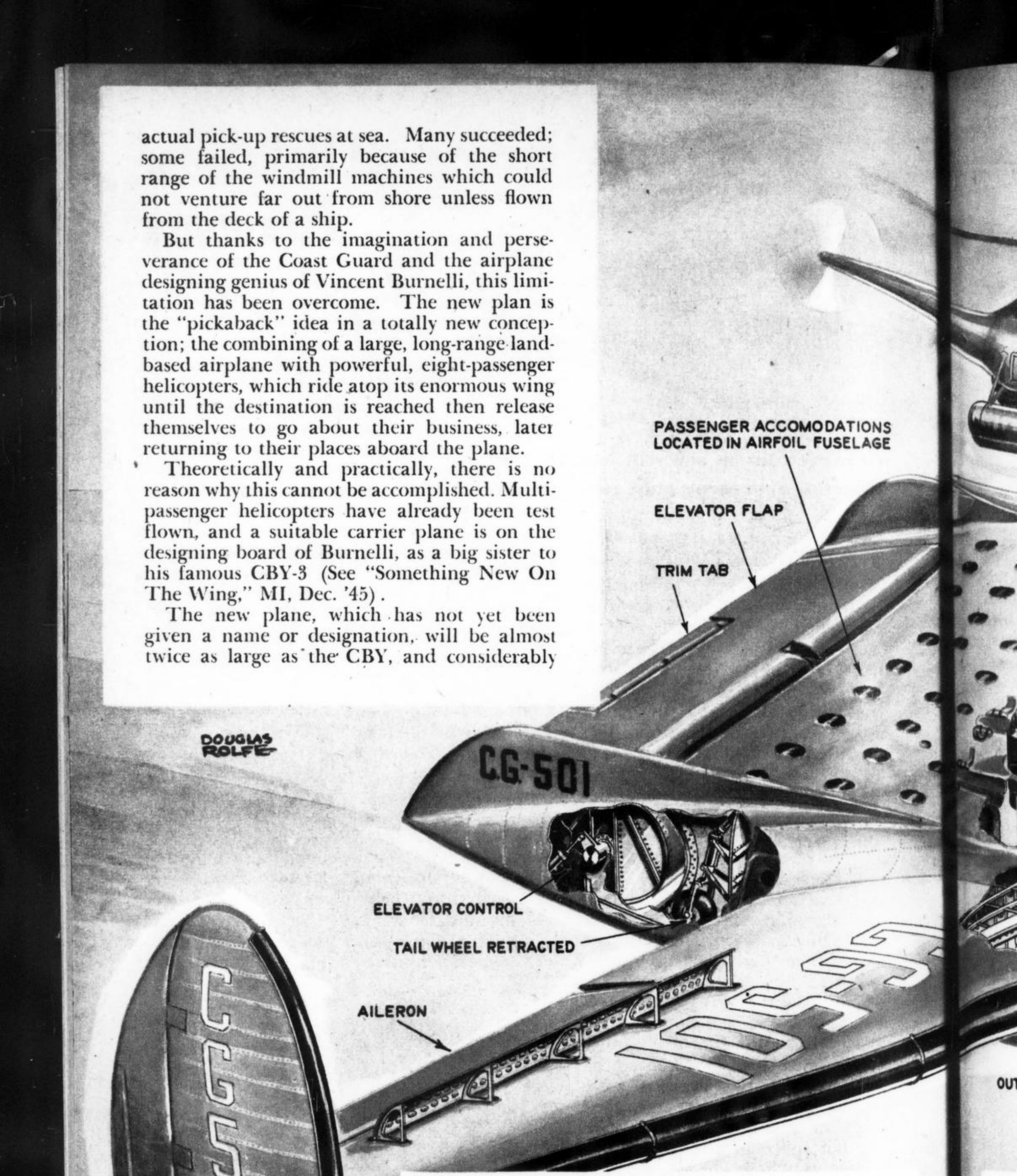
Burnelli's flying wing, above, and the Navy's twin-engine helicopter at right may be forerunners of the giant rescue plane pictured on the following pages.

actual pick-up rescues at sea. Many succeeded; some failed, primarily because of the short range of the windmill machines which could not venture far out from shore unless flown from the deck of a ship.

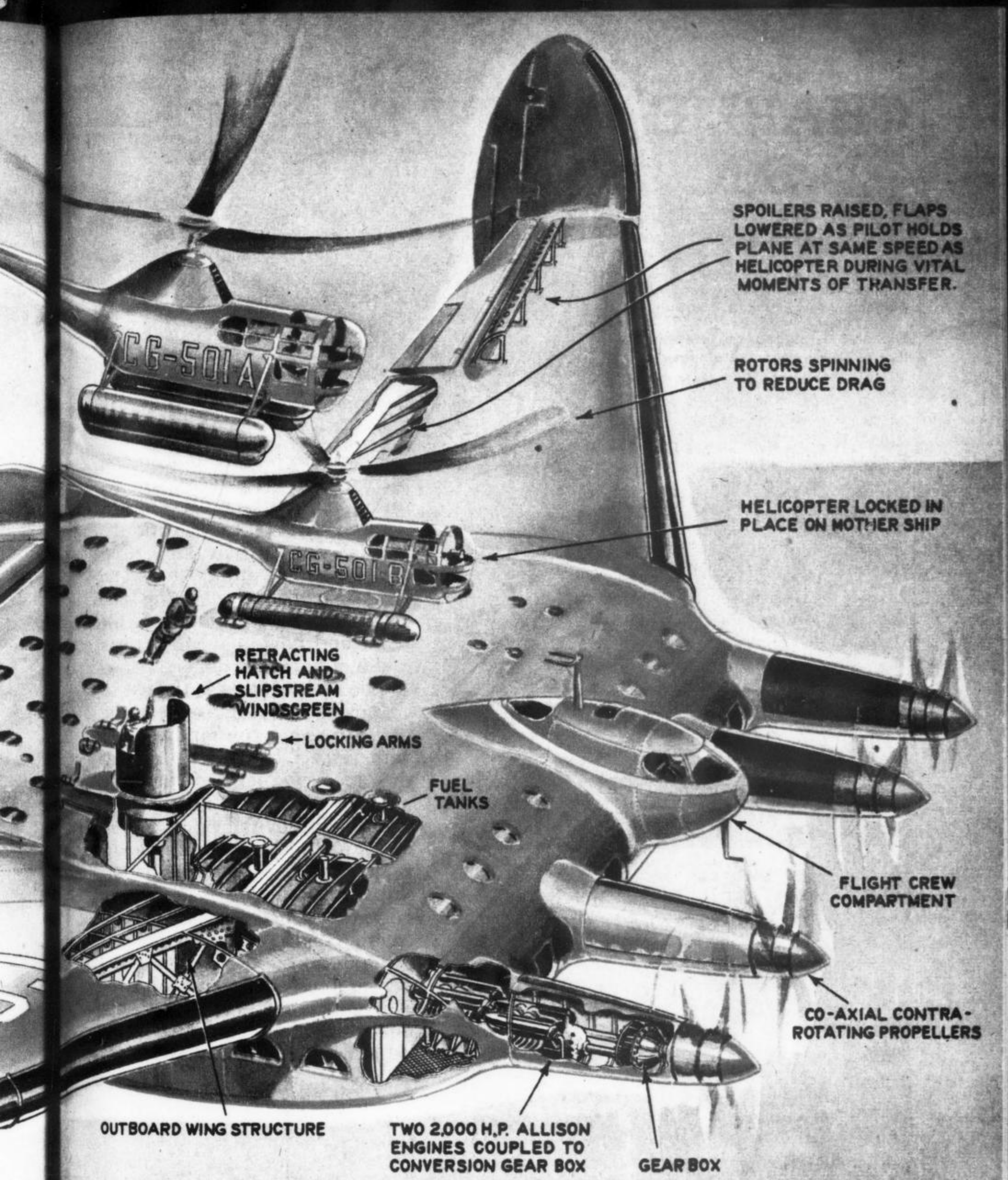
But thanks to the imagination and perseverance of the Coast Guard and the airplane designing genius of Vincent Burnelli, this limitation has been overcome. The new plan is the "pickaback" idea in a totally new conception; the combining of a large, long-range land-based airplane with powerful, eight-passenger helicopters, which ride atop its enormous wing until the destination is reached then release themselves to go about their business, later returning to their places aboard the plane.

Theoretically and practically, there is no reason why this cannot be accomplished. Multi-passenger helicopters have already been test flown, and a suitable carrier plane is on the designing board of Burnelli, as a big sister to his famous CBY-3 (See "Something New On The Wing," MI, Dec. '45).

The new plane, which has not yet been given a name or designation, will be almost twice as large as the CBY, and considerably



bigger than the B-29. It will follow the flying wing principle of all Burnelli's airplanes, with wing and fuselage (Burnelli doesn't like the word "fuselage"; he says it implies an airplane design that's as obsolete as the biplane) an integral airfoil unit contributing to the lift. Clyde Pangborn, famous flyer and test pilot who has flown many of Burnelli's ships,



says that this principle accounts for the amazing combination of speed, payload, handling ease and high safety factors inherent in the CBY.

The new ship will have a span of 200 feet, gross weight of 140,000 lbs. and a cargo and passenger space of 17,000 cubic feet—roughly equivalent to five box cars. Driven by four contra-rotating propellers geared to eight intra-wing engines delivering a total of 16,000 hp, it will cruise at 310 mph, and have a 4,000-mile range.

As a transport it will have a capacity of 160 passengers, and as a pickaback, 60.